AM/FM STEREO RECEIVER

SX-1980

SERVICE MANUAL

PIONEER

MODEL SX-1980 COMES IN FIVE VERSIONS DISTINGUISHED AS FOLLOWS:

Type	Voltage	Remarks
KU	120V only	U.S.A. model
KC	120V only	Canada model
HG	220V and 240V (Switchable)	Europe or Oceania model
S	110V, 120V, 220V and 240V (Switchable)	General export model
S/G	110V, 120V, 220V and 240V (Switchable)	U.S. Military model

This service manual is applicable to the KU type. For servicing of the HG, S, S/G, KC types please refer to the additional service manual.

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1. SPECIFICATIONS

Semiconductors

FETs	12
ICs	11
Transistors	130
Diodes	84

Power Amplifier Section

Continuous power output of 270 watts* per channel min., at 8 ohms from 20 Hertz to 20,000 Hertz with no more than 0.03% total harmonic distortion.

Total Harmonic Distortion (20 Hertz to 20,000 Hertz)	
Continuous Rated Power Output	No more than 0.03%
135 watts per channel power output, 8 ohms	No more than 0.02%
1 watt per channel power output, 8 ohms	No more than 0.02%
Intermodulation Distortion (50 Hertz: 7,000 Hertz=4:1)	
Continuous Rated Power Output	No more than 0.03%
135 watts per channel power output, 8 ohms	No more than 0.01%
1 watt per channel power output, 8 ohms	No more than 0.006%
Frequency Response	5 Hertz to 100,000 Hertz $^{+0}_{-1}$ dB
Input Sensitivity/Impedance (POWER AMP IN)	2V/50 kilohms
Output	
Speaker	A, B, C, A+B, B+C, A+C
Damping Factor (20 Hertz to 20,000 Hertz, 8 ohms)	40
Hum and Noise (IHF, short-circuited, A Network)	120dB

Preamplifier Section

Input Sensitivity/Impedance	
PHONO 1	2.5mV/10, 50, 100 kilohms
Cartridge load (capacitance)	100, 200, 300, 400pF
PHONO 2	2.5mV/50 kilohms
MIC	7.5mV/50 kilohms
AUX	150mV/50 kilohms
TAPE PLAY 1	150mV/50 kilohms
TAPE PLAY 2	150mV/50 kilohms
PHONO Overload Level (1kHz; T.H.D. 0.03%)	
PHONO 1, 2	300mV
Output Level/Impedance	
TAPE REC 1	150mV
TAPE REC 2	150mV
PRE OUT	2V/1 kilohms
Total Harmonic Distortion (20Hz to 20,000Hz, 2V output)	No more than 0.01%
Frequency Response	
PHONO(RIAA Equalization)	20Hz to 20,000Hz ±0.2dB
AUX, TAPE PLAY	5Hz to 80,000Hz $^{+0}_{-1}$ dB
Tone Control	
BASS Main control	±10dB (100Hz)
Sub control	± 5dB (50Hz)
TREBLE Main control	±10dB (10kHz)
Sub control	± 5dB (20kHz)
Filter	
LOW	15Hz (12dB/oct.)
HIGH	8kHz (12dB/oct.)
Loudness Contour (Volume control set at −40dB position)	+6dB (100Hz), +3dB (10kHz)
Hum and Noise (IHF, short-circuited, A network)	
PHONO (PHONO INTERFERENCE FILTER switch OFF)	87dB
AUX, TAPE PLAY	100dB
Muting	−20dB

FM Section

Usable Sensitivity	
MONO	8.7dBf (1.5μV)
50dB Quieting Sensitivity	
MONO	11.5dBf (2.2μV)
STEREO	36.0dBf (34μV)
Signal-to-Noise Ratio	
(at 75dBf) STEREO	75dB
(at 65dBf) MONO	83dB
STEREO	74dB
Distortion (at 65dBf)	
100Hz MONO/STEREO	0.05%/0.1%
1kHz MONO/STEREO	0.07%/0.1%
6kHz MONO/STEREO	0.2%/0.2%
Frequency Response	30Hz to 15,000Hz $^{+0.2}_{-0.5}$ dB
Capture Ratio	1.0dB
Alternate Channel Selectivity	80dB
Spurious Response Ratio	120dB
Image Response Ratio	120dB
IF Response Ratio	120dB
AM Suppression Ratio	60dB
Muting Threshold	19.2dBf (5μV)
Stereo Separation	50dB (1kHz), 40dB (30Hz~15kHz)
Subcarrier Product Ratio	65dB
SCA Rejection Ratio	65dB
Antenna Input	300 ohms balanced 75 ohms unbalanced

AM Section

Sensitivity	(IHF, Ferrite antenna)	300μV/m
	(IHF, Ext. antenna)	15μV
Selectivity		26dB
Signal-to-Noise Ratio		55dB
Image Response Ratio		70dB
IF Response Ratio		70dB
Antenna		Built-in Ferrite Loopstick Antenna

Miscellaneous

Power Requirements		120V 60Hz
Power Consumption		650W (UL), 1,400VA (CSA) 1400W (max.)
Dimensions		560(W) x 211(H) x 497(D)mm 22-1/16(W) x 8-5/16(H) x 19-9/16(D)in
Weight	Without Package	35.4kg (78lb)
	With Package	40.3kg (88lb 14oz)

Furnished Parts

FM T-type Antenna	1
Operating Instructions	1
Hex. Wrench	1

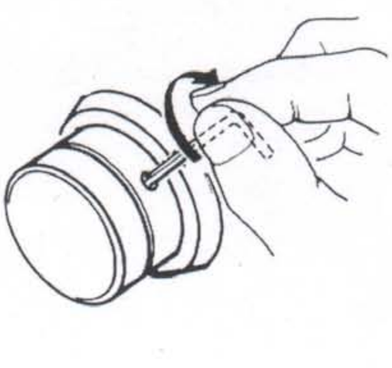
**Measured pursuant to Federal Trade Commission's Trade Regulation rule on Power Output Claims for Amplifiers.*

NOTE:
Specifications and the design subject to possible modification without notice due to improvements.

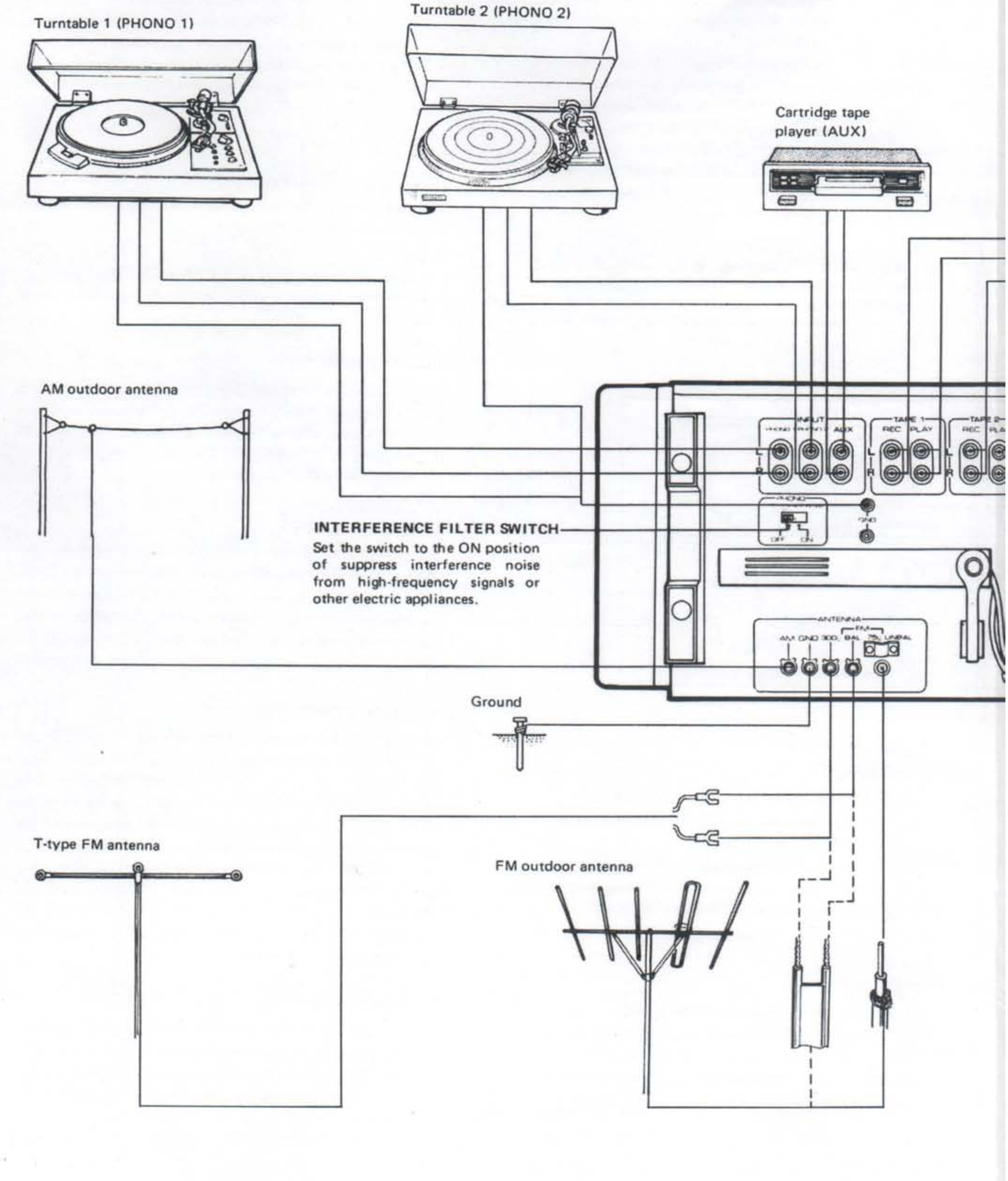
HEX WRENCH

The accessory hexagonal wrench is provided for removing the TUNING knob and VOLUME knob or tightening their set screws should they become loose.

If required, loosen the set screw by inserting the wrench into the hole on the side of the knob and turning the wrench counter-clockwise. Be particularly careful not to scratch the front panel when employing the wrench.



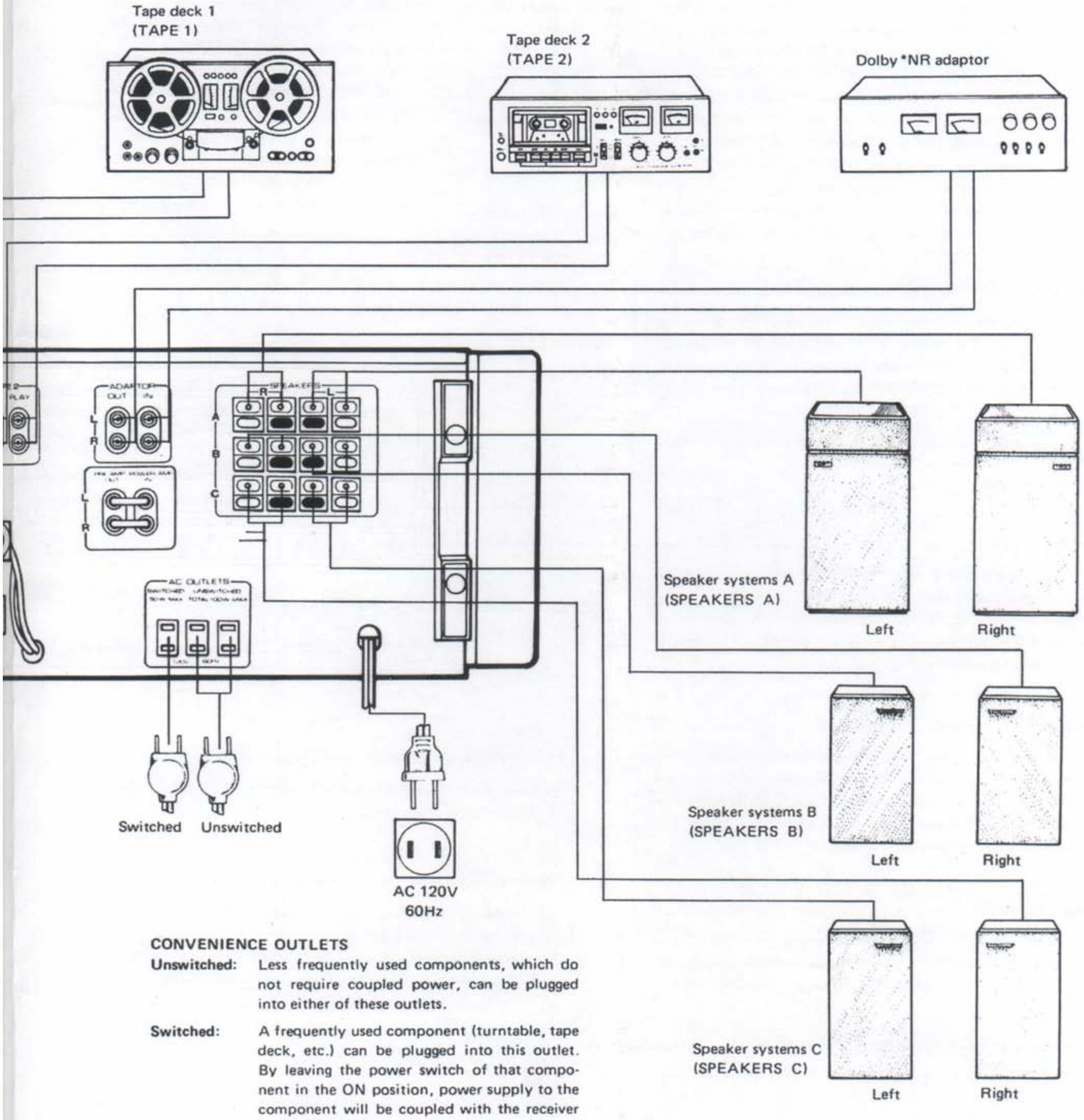
2. CONNECTION DIAGRAM



INTERFERENCE FILTER SWITCH

Set the switch to the ON position of suppress interference noise from high-frequency signals or other electric appliances.

Turntable 1 (PHONO 1)
Turntable 2 (PHONO 2)
Cartridge tape player (AUX)
AM outdoor antenna
INPUT
PHONO 2
AUX
TAPE 1
REC
PLAY
TAPE 2
REC
L
R
PHONO
GND
OFF
ON
ANTENNA
FM
AM
GND
300Ω BAL
75Ω UNBAL
Ground
T-type FM antenna
FM outdoor antenna


Tape deck 1
(TAPE 1)
Tape deck 2
(TAPE 2)
Dolby *NR adaptor
ADAPTOR
OUT
IN
PLAY
L
R
SPEAKERS
R
L
A
B
C
AC OUTLETS
Switched
Unswitched
AC 120V
60Hz
Speaker systems A
(SPEAKERS A)
Left
Right
Speaker systems B
(SPEAKERS B)
Left
Right
Speaker systems C
(SPEAKERS C)
Left
Right

CONVENIENCE OUTLETS

Unswitched:	Less frequently used components, which do not require coupled power, can be plugged into either of these outlets.
Switched:	A frequently used component (turntable, tape deck, etc.) can be plugged into this outlet. By leaving the power switch of that component in the ON position, power supply to the component will be coupled with the receiver switch operation.

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* The word "Dolby" is a trademark of Dolby Laboratories Inc.

3. FRONT PANEL FACILITIES

FILTER BUTTONS

15Hz . . When this button is pressed, a 12dB/oct attenuation can be provided for frequencies below 15Hz. This means that you can cancel out noise in the ultra-low frequencies which is generated by low-pitched rumble from a turntable and other forms of distortion. Although this noise cannot be heard, it can generate intermodulation distortion and damage the speakers.

8kHz . . Press this button to provide a 12dB/oct attenuation at frequencies above 8kHz. Set it to this position when you find high-frequency noise, such as that from scratched records, unpleasant.

SPEAKERS BUTTONS

Press the button corresponding to the speakers connected to the SPEAKERS terminals (A, B, C) on the rear panel. You can press two of these buttons to listen to sound from two pairs of speaker systems at the same time.

NOTE:
No sound will be heard through the speakers if all three buttons are pressed at the same time.

PHONES JACK

Plug the headphones into this jack when you want to listen through your stereo headphones.
Release all the SPEAKERS buttons if you want to listen to the sound through your headphones only. (This means that all three buttons will be released).

POWER SWITCH

Flip this switch to the ON position to supply power to the stereo receiver. There will be a short delay when it is set to ON, because the muting circuit has been actuated to suppress the unpleasant noise that is sometimes generated when the power is switched on and off.

TONE SWITCH

Set this switch to ON when adjusting the BASS and TREBLE controls. In the OFF position, it causes the amplifier to operate with a flat frequency response.

TWIN BASS AND TREBLE CONTROLS

Use these controls to adjust the bass and the treble.

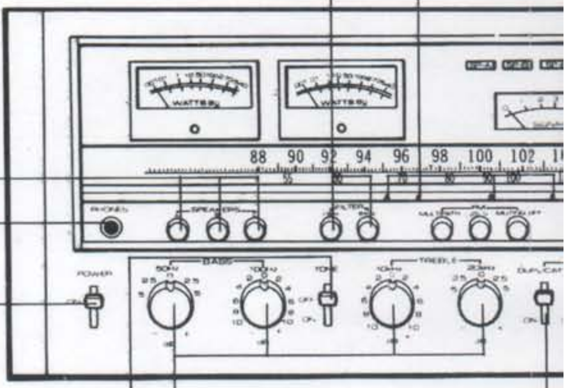
FUNCTION BUTTONS

Press the function button which corresponds to the program source. Turn the VOLUME control down first before selecting a different function button while the sound from one program source is being reproduced.

FM	Press this button for FM broadcasts. The FM STEREO indicators light up when the receiver is tuned into an FM stereo broadcast. The sound is automatically received monophonically during FM monophonic broadcasts.
AM	Press this button for AM broadcasts.

MEMORY MARKERS

These are very convenient for frequent tuning in to the same broadcasting station.



TAPE DUPLICATE SWITCH

Set this switch to ON when you want to duplicate or edit a pre-recorded tape using two tape decks.

TAPE MONITOR SWITCHES (1, 2)

Set switch 1 to ON with a tape deck which is connected to the TAPE 1 jacks (REC and PLAY) when you want to monitor the playback or recording of a tape. The tape on a deck which is connected to the TAPE 2 jacks (REC and PLAY) can be similarly monitored by setting switch 2 to ON.

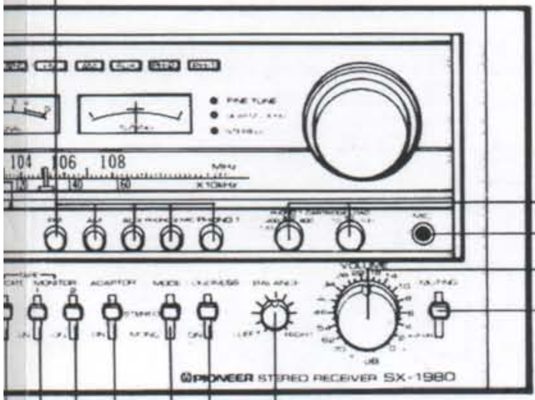
NOTE:
Set these switches to the upper (off) position when listening to records or a broadcast.

Continued next page

AUX.	Press this button when listening to an audio component connected to the AUX input jacks.
PHONO 2/MIC . .	Press this button when playing a record on the turntable connected to the PHONO 2 jacks, or when using a microphone which you have plugged into the MIC jack.
PHONO 1	Press this button when playing a record on the turntable connected to the PHONO 1 jacks.

NOTES:

1. *Unplug the microphone from the MIC jack when you do not intend to use the microphone otherwise you will not be able to use the PHONO 2 jacks.*
2. *Only one function button should be pressed at a time:*



MODE SWITCH

Use this switch for selecting mono or stereo performances.

STEREO:	Set to this position for normal stereo operation.
MONO:	When set to this position, the left and right channel signals will be mixed and reproduced monophonically from both speaker systems.

ADAPTOR SWITCH

Set this switch to ON when reproducing sound from an optional component which has been connected to the ADAPTOR jacks. Always set it to its upper position if you are not using a component with these terminals.

PHONO 1 CARTRIDGE LOAD SWITCH

Use this knob to select the input impedance (ohms) and the input capacitance (pF) in accordance with the specified load impedance and load capacitance of the moving magnet (MM) cartridge connected to the PHONO 1 jacks.

MIC JACK

Plug your microphone into this jack.

The microphone signals are reproduced in mono through the left and right speakers.

NOTE:

A high impedance (approx. 50 kilohms) dynamic type microphone with a standard plug can be connected to this jack.

VOLUME CONTROL

Use this control to adjust the output level to the speakers and headphones. Turn it clockwise to increase the output level. No sound will be heard if you set it to ∞. The scale is graduated in dB which indicate the attenuation when the maximum output level is 0dB.

MUTING SWITCH

Set this switch to the −20dB position to attenuate the audio output indicated by the VOLUME control by 20dB. There is no need to adjust the VOLUME control if you use this switch when turning down the audio output temporarily and when changing over records or tapes.

BALANCE CONTROL

Use this control to balance the volume of the left and right channels. First, however, set the MODE switch to MONO, and adjust so that the sound appears to come from somewhere exactly between the two speakers. If the sound appears to be louder on the right, it means that the volume of the right channel is higher. Turn the BALANCE control to the left and adjust. Conversely, if the sound appears to be louder on the left, it means that the volume of the left channel is higher. Therefore, turn the BALANCE control to the right and adjust. After adjusting, return the MODE switch to STEREO.

LOUDNESS SWITCH

Set this switch to ON when listening at a low volume. The frequency response of the human ear varies according to the listening volume, and setting this switch to the ON position compensates for hearing response by emphasizing the bass and treble.

POWER METERS

These power meters allow you to read out the rated power level when speakers with a nominal impedance of 8 ohms are connected to the receiver's speaker terminals.

NOTE:
These values are related to the impedance of the speakers and they vary according to the frequency. In order to find out the exact output level, connect an 8-ohm dummy load instead of the speakers.

SIGNAL METER

When tuning in to an AM or FM station, the optimum reception position is indicated by the maximum deflection of the meter pointer to the right.

SPEAKER INDICATOR

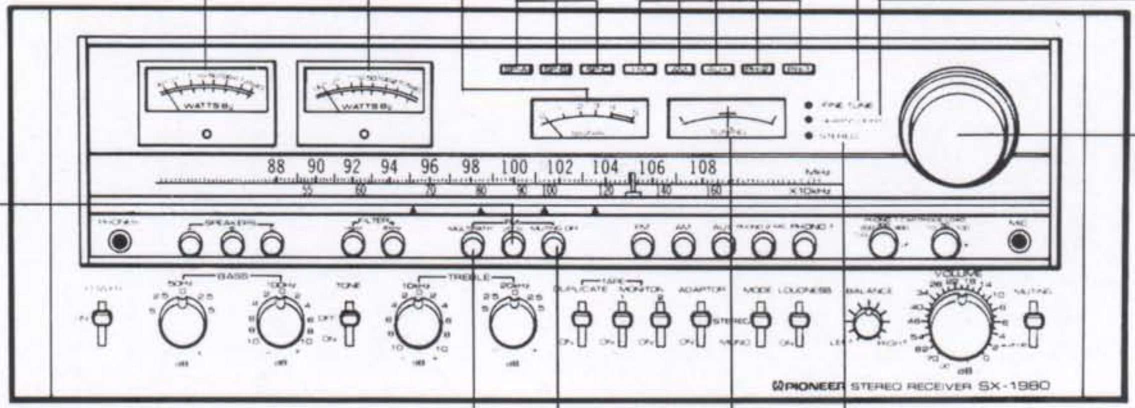
QUARTZ-LOCKED INDICATOR

When you let go of the tuning knob which has been used to tune an FM station for optimum reception, the FINE TUNE indicator will go off and this indicator will come on.
The automatic phase control circuit is actuated and it tunes the receiver correctly into the frequency of the broadcasting station and locks on to this frequency. (This indicator will not light up with stations whose broadcasting frequency is not a multiple of 100kHz).

FINE TUNE INDICATOR

This indicator lights up to show the optimum tuning position on the tuning dial of an FM station when the pointer of the TUNING meter deflects to near the center.
(This indicator will not light up with stations whose broadcasting frequency is not a multiple of 100kHz.)

FUNCTION INDICATOR



FM MULTIPATH BUTTON

Use this button to detect multipath sound when installing the FM antenna in a position which yields the minimum multipath interference.

FM 25µS BUTTON

Press this button when listening to a Dolby FM broadcast; otherwise keep this button at the released position.

FM MUTING BUTTON

ON (released position) . . .	Release this button to suppress unpleasant inter-station noise when tuning in to FM stations.
OFF (depressed position) .	Depress this button to pick up weak stations.

STEREO INDICATOR

This indicator lights up when the receiver is tuned to receive an FM stereo broadcast.

TUNING METER

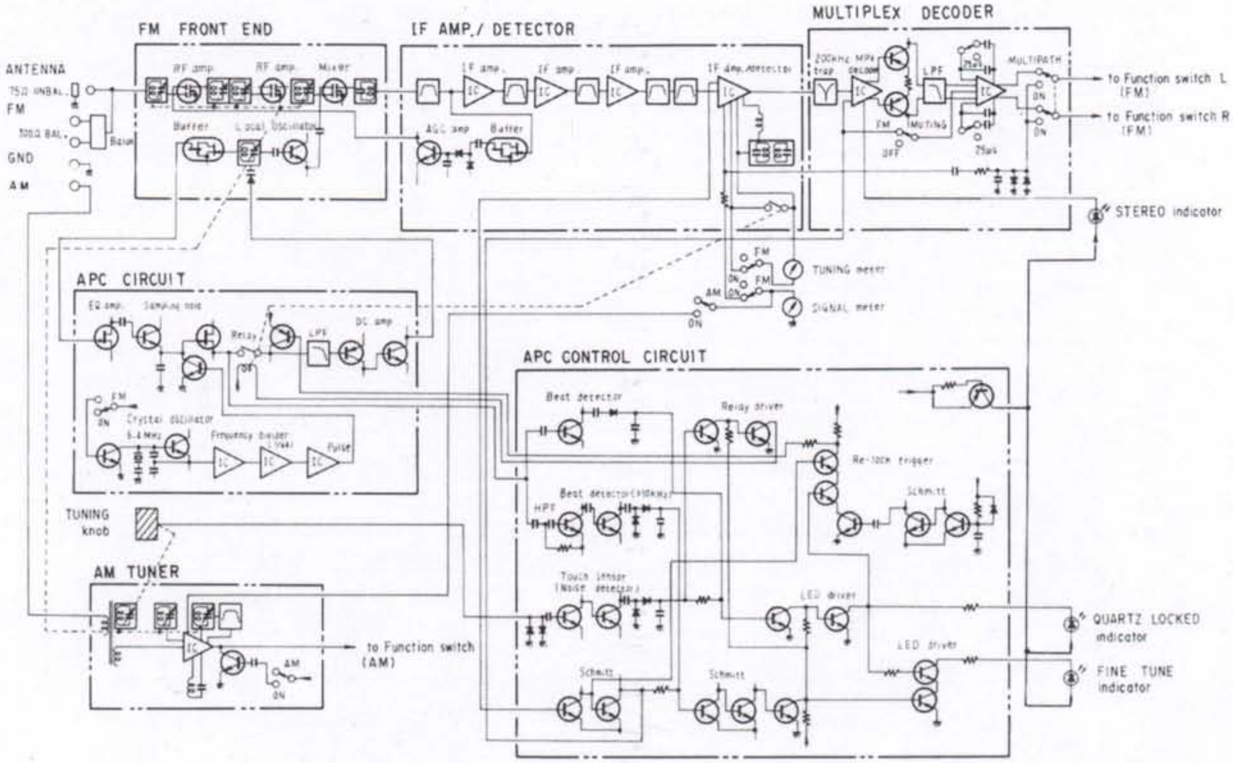
When tuning in an FM station, the optimum reception position is indicated when the meter pointer deflects to dead center. Check that the SIGNAL meter pointer has deflected as far to the right as possible.

TUNING KNOB

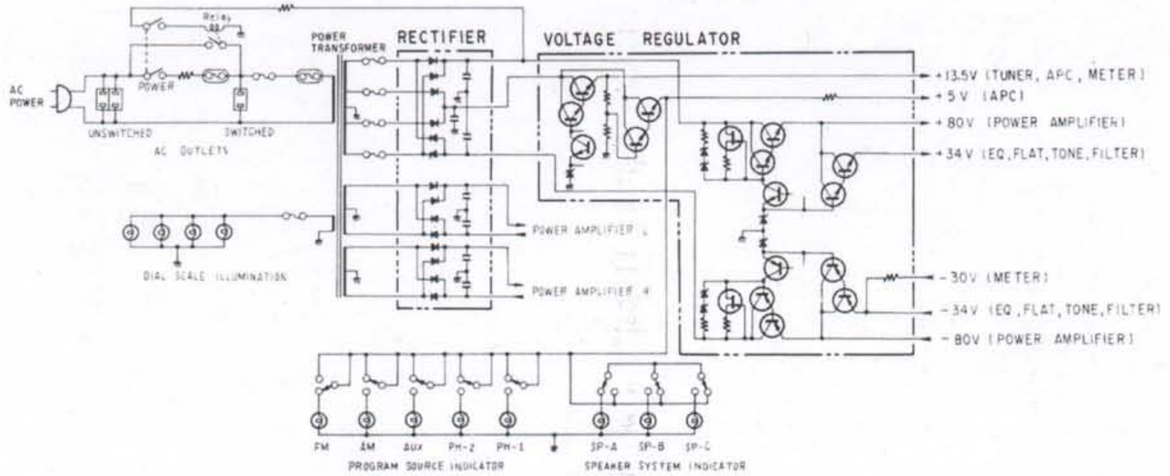
Use this to tune in to broadcasting stations.
Select the station and tune for optimum reception by observing the SIGNAL meter for AM stations and both the SIGNAL and TUNING meters for FM stations.

4. BLOCK DIAGRAM

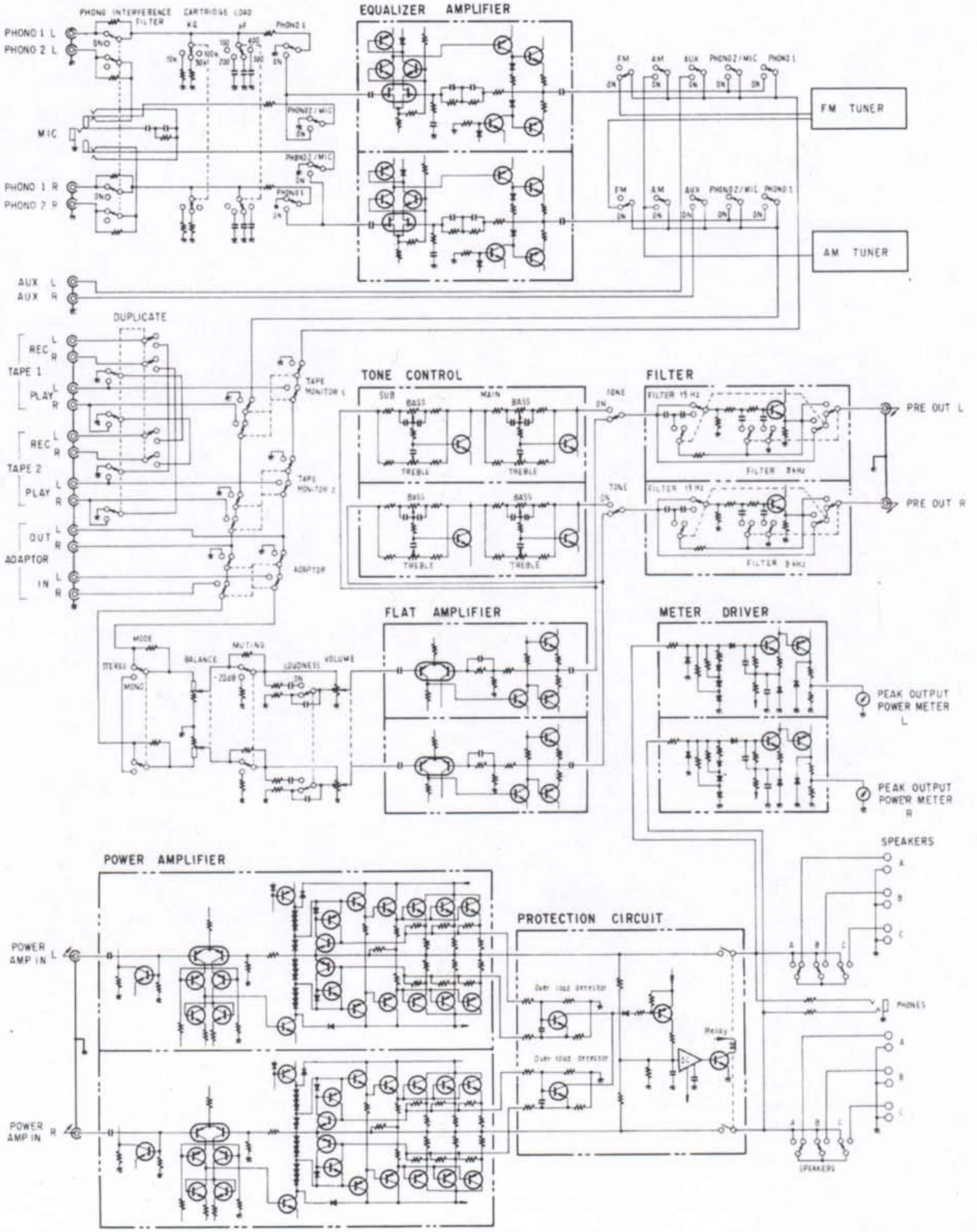
4.1 TUNER SECTION


FM FRONT END
IF AMP./ DETECTOR
MULTIPLEX DECODER
ANTENNA
75Ω UNBAL.
FM
300Ω BAL.
GND
AM
Balun
RF amp.
RF amp.
Mixer
Buffer
Local Oscillator
IF amp.
IF amp.
IF amp.
IF amp.
IF Amp./detector
AGC amp
Buffer
IC
200kHz trap
MPX decoder
LPF
MULTIPATH
ON
ON
FM
MUTING
OFF
75μs
25μs
to Function switch L (FM)
to Function switch R (FM)
STEREO indicator
FM
ON
FM
AM
ON
ON
TUNING meter
SIGNAL meter
APC CIRCUIT
EQ amp.
Sampling hold
Relay
OFF
LPF
DC amp
FM
ON
Crystal oscillator
6.4 MHz
Frequency Divider
Pulse
APC CONTROL CIRCUIT
Beat detector
Relay driver
Re-lock trigger
Beat detector(±10kHz)
HPF
Schmitt
Touch sensor (Noise detector)
LED driver
LED driver
Schmitt
Schmitt
QUARTZ LOCKED indicator
FINE TUNE indicator
TUNING knob
AM TUNER
to Function switch (AM)
AM
ON

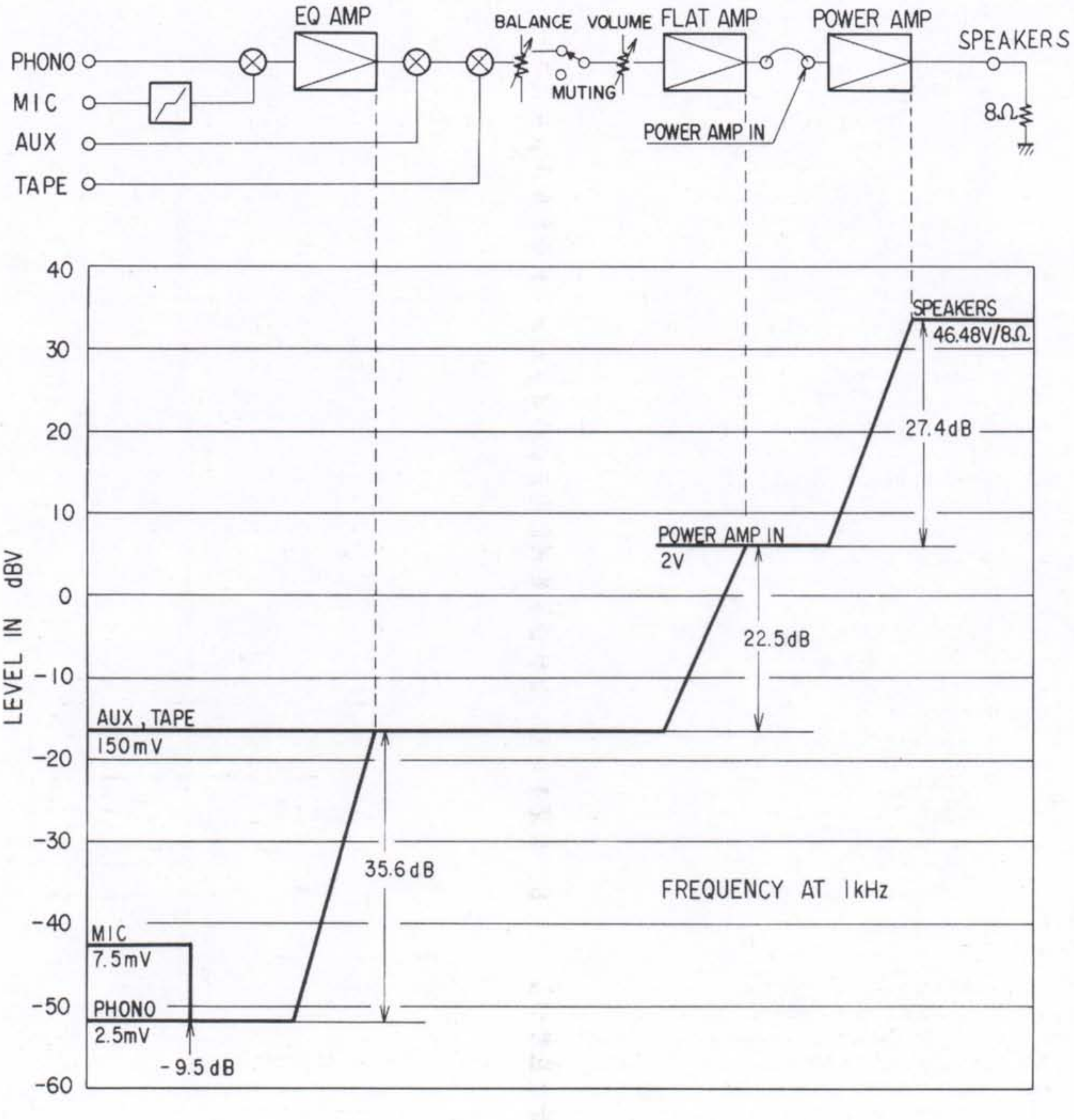
4.2 POWER SUPPLY SECTION


AC POWER
Relay
POWER
UNSWITCHED
SWITCHED
AC OUTLETS
POWER TRANSFORMER
RECTIFIER
VOLTAGE REGULATOR
DIAL SCALE ILLUMINATION
POWER AMPLIFIER L
POWER AMPLIFIER R
+13.5V (TUNER, APC, METER)
+5 V (APC)
+80V (POWER AMPLIFIER)
+34V (EQ, FLAT, TONE, FILTER)
-30V (METER)
-34V (EQ, FLAT, TONE, FILTER)
-80V (POWER AMPLIFIER)
FM
AM
AUX
PH-2
PH-1
SP-A
SP-B
SP-C
PROGRAM SOURCE INDICATOR
SPEAKER SYSTEM INDICATOR

4.3 AF AMPLIFIER SECTION


PHONO INTERFERENCE FILTER
CARTRIDGE LOAD
kΩ
pF
10k
100k
50k
100
200
300
400
PHONO 1
ON
PHONO 1 L
PHONO 2 L
MIC
PHONO 1 R
PHONO 2 R
PHONO2/MIC
EQUALIZER AMPLIFIER
FM
AM
AUX
PHONO2/MIC
PHONO 1
FM TUNER
AM TUNER
AUX L
AUX R
DUPLICATE
REC L R
TAPE 1
PLAY L R
REC L R
TAPE 2
PLAY L R
OUT L R
ADAPTOR
IN L R
TAPE MONITOR 1
TAPE MONITOR 2
ADAPTOR
TONE CONTROL
SUB
MAIN
BASS
TREBLE
TONE ON
FILTER
FILTER 15 Hz
FILTER 8 kHz
PRE OUT L
PRE OUT R
MODE
STEREO
MONO
BALANCE
MUTING
-20dB
LOUDNESS
VOLUME
FLAT AMPLIFIER
METER DRIVER
PEAK OUTPUT POWER METER L
PEAK OUTPUT POWER METER R
POWER AMPLIFIER
POWER AMP IN L
POWER AMP IN R
PROTECTION CIRCUIT
Over load detector
Over load detector
IC
Relay
SPEAKERS
A
B
C
PHONES
SPEAKERS

5. LEVEL DIAGRAM



EQ AMP
BALANCE
VOLUME
FLAT AMP
POWER AMP
SPEAKERS
PHONO
MIC
AUX
TAPE
MUTING
POWER AMP IN
8Ω
40
30
20
10
0
-10
-20
-30
-40
-50
-60
LEVEL IN dBV
SPEAKERS
46.48V/8Ω
27.4dB
POWER AMP IN
2V
22.5dB
AUX, TAPE
150mV
35.6dB
FREQUENCY AT 1kHz
MIC
7.5mV
PHONO
2.5mV
-9.5dB

6. CIRCUIT DESCRIPTIONS

6.1 TUNER SECTION

A major feature of the FM tuner section of the SX-1980 is the APC (Automatic Phase Control) system which detects any difference in phase between the front end local oscillator signal and the reference signal generated by the crystal oscillator. This difference is converted into a voltage signal which is then fed back to the local oscillator; locking the phase of the local oscillator signal precisely to that of the reference signal. The frequency of this reference signal is 100kHz, so when the APC circuit is operating, the frequency of the local oscillator will be an exact integer multiple of 100kHz, as will be that of the received signal frequency.

Another important feature of this equipment is the touch sensor circuit. When the TUNING knob is touched by hand, the APC circuit is deactivated, permitting the tuned frequency to be freely varied just as in conventional equipment. When a broadcasting station whose frequency is an integer multiple of 100kHz, and whose input level exceeds a certain fixed level (more than $10\mu V$ antenna input conversion) is tuned exactly, and the hand released from the TUNING knob, the APC circuit is activated, locking the phase of the local oscillator frequency exactly to the reference frequency. The stability of the local oscillator at this time is the same as that of the reference frequency, that is, the same high stability as the crystal oscillator itself.

Note, however, that if the frequency of the tuned broadcasting station is not an exact integer multiple of 100kHz, or if the input level falls below the fixed level, the APC circuit will not be activated. In this case, the SX-1980 will function as any other receiver.

For further details on the APC circuit, refer to the section titled "APC Circuit".

6.1.1 FM Front End

The FM front end of the SX-1980 includes a 5-ganged tuning capacitor, a dual-gate MOS FET-equipped 2-stage RF amplifier and mixer, and an NPN transistor-type modified Clapp circuit local oscillator. This local oscillator is a voltage controlled oscillator (VCO) employing a variable capacitance diode in the tuning capacitor. The oscillator frequency is controlled by the APC circuit by means of a control voltage signal applied to this variable capacitance diode. When the APC circuit is not in operation, a constant voltage is applied to the diode. Note that the APC phase comparator signal is passed from the local oscillator output to the APC circuit via a buffer amplifier.

With an AGC (Automatic Gain Control) circuit in the first stage of the RF amplifier, gain is decreased for forced inputs, thereby improving a number of different parameters.

6.1.2 IF Amplifier and Detector

Employs 4 ICs and 5 dual-element ceramic filters. The IC (HA1201) of the first 3 stages constitutes a single-stage differential amplifier current-limiting limiter. The IC (PA3001-A) in the forth stage (an improvement on the former IF system IC, HA1137), includes an IF limiter amplifier, quadrature detector, meter drive, and other circuits. Performance in terms of distortion, S/N ratio, delay characteristics, and other parameters, shows a marked improvement in comparison to the HA1137. Forthermore, the AGC control voltage produces an IF signal from the IF amplifier input stage; this signal then being passed via a buffer amplifier for rectification (AM detection) and amplification.

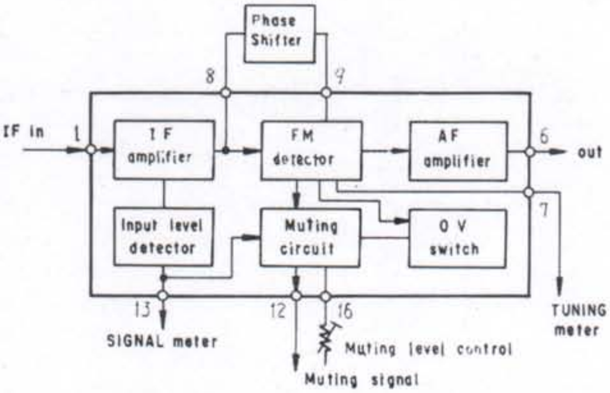


Fig. 6-1 Block Diagram of PA3001-A

6.1.3 Multiplex Decoder

The IC (PA1001-A) employed in this stage is equipped with an NFB Demodulator and Automatic Pilot Canceller which further reduce distortion and improve the S/N ratio (in comparison to the earlier PLL-MPX decoder ICs, HA1196 and HA1156). A major feature of this Automatic Pilot Canceller is that the cancelling level automatically adjusts to the pilot signal level (see Fig. 6-3).

Furthermore, this circuit has also made it possible to raise the dip point of the low-pass filter, and improve the frequency response in the 15kHz region which previously suffered from the effects of filter coil Q.

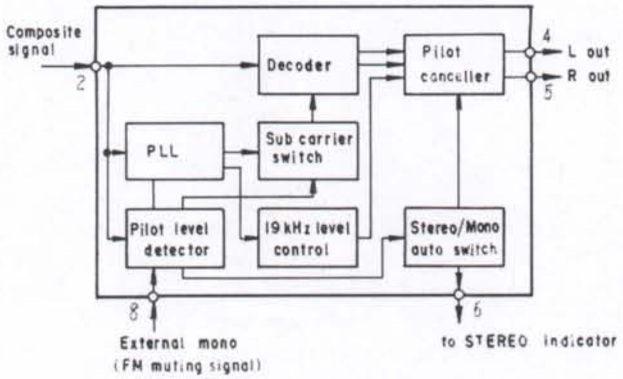

Composite signal
2
Decoder
Pilot canceller
4
L out
R out
5
PLL
Sub carrier switch
Pilot level detector
19 kHz level control
Stereo/Mono auto switch
8
6
External mono
(FM muting signal)
to STEREO indicator

Fig. 6-2 Block Diagram of PA1001-A

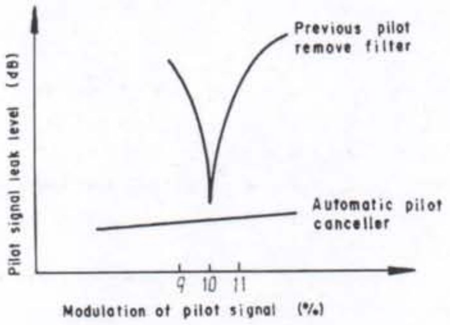


Fig. 6-3 Automatic Pilot Canceller

6.1.4 Audio Output Circuit

The IC (PA1002-A) employed in this stage incorporates a high S/N ratio (greater than 90dB) AF amplifier, a muting gate circuit, and the muting control circuit activated when the power supply is switched on and off. (See Fig. 6-4 for the block diagram of this IC).

The muting gate is an electronic circuit which connects the signal path to ground, but with practically no noise generated whenever it is activated or de-activated. This circuit is activated by muting signals (DC voltage) applied to no.8 pin and the power supply ON/OFF muting control circuit.

The de-emphasis characteristics are determined by use of the NFB loop in the AF amplifier.

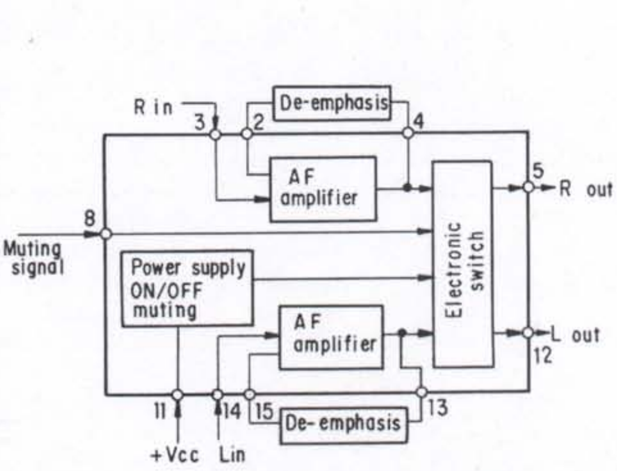

R in
3
2
De-emphasis
4
AF amplifier
5
R out
8
Muting signal
Power supply ON/OFF muting
Electronic switch
AF amplifier
L out
12
11
14
15
De-emphasis
13
+Vcc
Lin

Fig. 6-4 Block Diagram of PA1002-A

6.1.5 APC Circuit

The contact of the relay shown in the APC Circuit block diagram below (Fig. 6-6) is opened and closed by the APC control circuit. Whenever the prescribed conditions are fulfilled, the contact is closed, and the PLL (Phase Locked Loop) circuit is activated.

Pulse Generator

The pulse generator employed in the SX-1980 consist of three digital ICs (for logic circuits) and a single transistor crystal oscillator (see Fig. 6-5). Although a 100kHz crystal resonator could have been used (since the required pulse repetition frequency is 100kHz), a 6.4MHz resonator is preferable because of its frequency stability, shape, size, cost, and other factors. This 6.4MHz signal is divided by a 6-flip-flop frequency divider to form the 100kHz square wave signal, which is then converted into a pulse signal by the one-shot multivibrator and inverter (formed by 3 NAND gates).

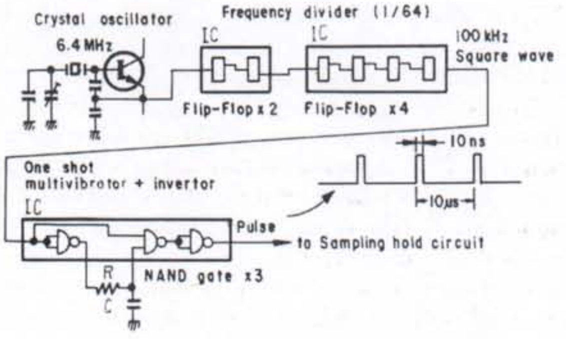

Crystal oscillator
6.4 MHz
Frequency divider (1/64)
IC
IC
100 kHz Square wave
Flip-Flop x 2
Flip-Flop x 4
10 ns
One shot multivibrator + invertor
IC
10μs
Pulse
to Sampling hold circuit
R
C
NAND gate x3

Fig. 6-5 Pulse Generating Circuit

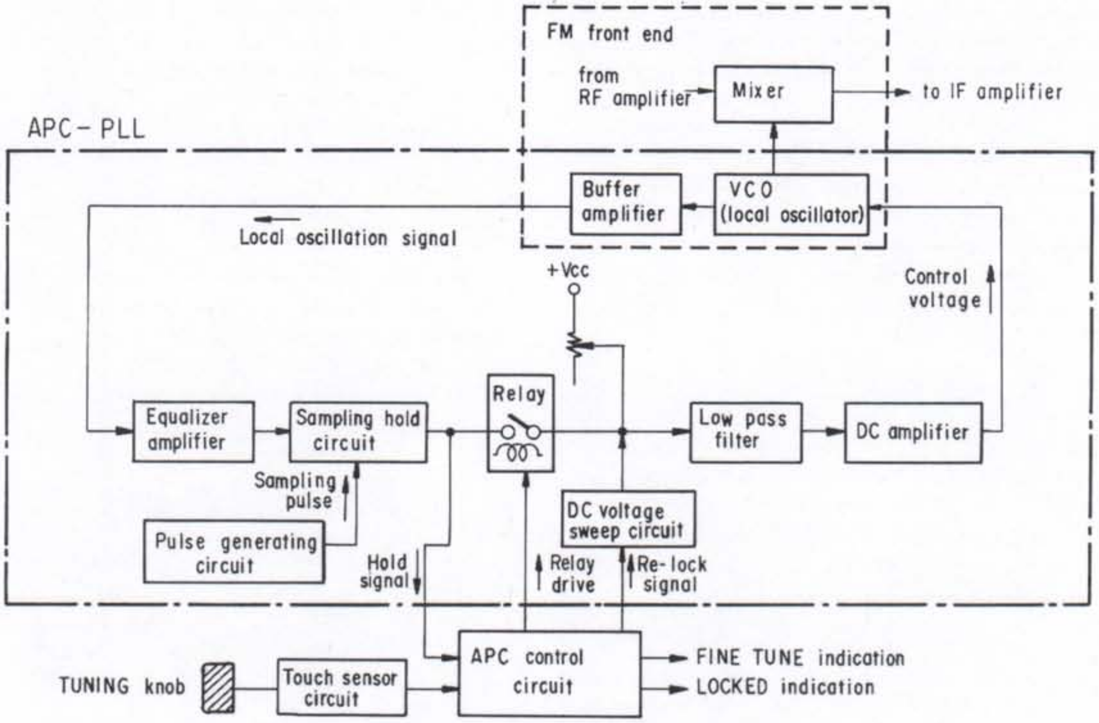

FM front end
from
RF amplifier
Mixer
to IF amplifier
APC – PLL
Buffer amplifier
VCO (local oscillator)
Local oscillation signal
+Vcc
Control voltage
Equalizer amplifier
Sampling hold circuit
Relay
Low pass filter
DC amplifier
Sampling pulse
Pulse generating circuit
Hold signal
DC voltage sweep circuit
Relay drive
Re-lock signal
APC control circuit
FINE TUNE indication
LOCKED indication
TUNING knob
Touch sensor circuit

Fig. 6-6 Block Diagram of APC Circuit

Sampling Hold Circuit

This circuit is the phase comparator which converts the phase difference between the reference pulse and local oscillator signal into the DC voltage signal. The conversion efficiency of this type of circuit is much higher than circuits which employ a multiplier to hold the signal. Consequently, a DC amplifier of quite low gain may be used in the following stage, thereby contributing to improved stability and S/N ratio. Furthermore, since the pulse width is not critical in this type of circuit, there is no need for extremely narrow pulse width.

A simplified circuit diagram is shown in Fig. 6-7, and the waveform generated shown in Fig. 6-8. In order to simplify the description, the pulse width will be assumed to be very narrow.

The local oscillator signal is applied to the base of Q_2 via the equalizer amplifier. When the pulse signal is then applied to the base of Q_3, Q_3 will turn on, and C_5 discharge rapidly. Current will also flow through Q_2 at this time. However when there is no pulse on Q_3, Q_3 will turn off, and during this instant, a reflection pulse will be generated by the circuit's inductance component. C_5 will thus be recharged, with the recharge voltage being held until the next pulse signal arrives (10μs later) due to the relatively high input impedance on Q_4 (FET). This hold voltage is the voltage of the reflection pulse and local oscillator signal, and will vary according to the phase of the local oscillator signal during sampling (see Fig. 6-8).

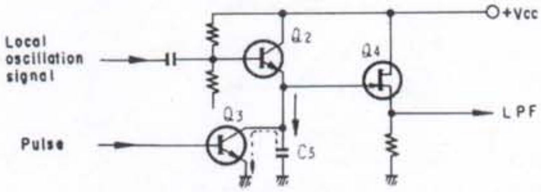

Local oscillation signal
Q2
Q4
+Vcc
LPF
Q3
Pulse
C5

Fig. 6-7 Sampling hold Circuit

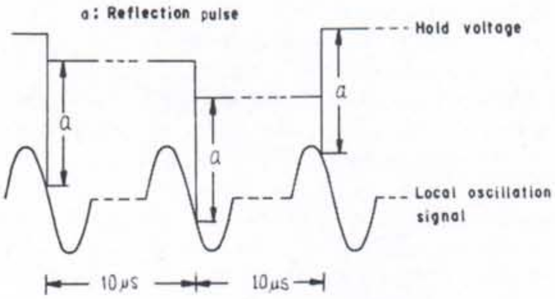

a: Reflection pulse
Hold voltage
a
a
a
Local oscillation signal
10μs
10μs

Fig. 6-8 Waveform of Sampling Hold

If the frequency of the local oscillator signal is an integer multiple of 100kHz, the phase will be the same every 10μs during sampling, and the hold voltage will remain constant. If it is not an integer multiple, the hold voltage will vary constantly in a step-wise fashion. If the envelope of the step-wise change is regarded as an AC signal, the period of fastest change will be during alternate sampling of the peaks and dips of the waveform every 10μs, which means the frequency will be 50kHz. Therefore, the frequency of the sampling hold-signal beat components will range from 0 to 50kHz.

LPF and DC Amplifier

This LPF (low-pass filter) is the PLL loop filter which determines the APC capture range and elimination of the sampling pulse. Since the conversion efficiency of the phase comparator (sampling hold circuit) is high, the gain of the DC amplifier is low. The diode D_1 incorporated in this circuit is used in loop temperature compensation.

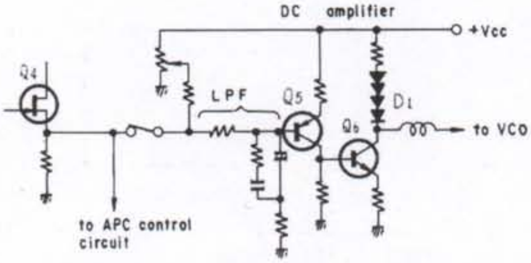


Fig. 6-9 LPF and DC Amplifier

VCO and Equalizer Amplifier

The FM front-end local oscillator incorporates a variable capacitance diode as part of its tuning capacitor, thereby making this Voltage Controlled Oscillator (VCO). This diode is reverse biased, and a control voltage is applied to the anode, resulting in the diode capacitance increasing when the control voltage is raised, and decreasing when the control voltage is lowered.

The main part of the tuning capacitor consists of a variable capacitor, but since the capacitance of the variable capacitor varies considerably according to the frequency of the received signal, the relative proportion of capacitance provided by the variable capacitance diode will also vary quite significantly. In this kind of situation, the APC circuit would not operate equally at different frequencies. Therefore, the relative capacitance of the variable capacitance diode must be kept at a constant level, which in turn requires a varying amount of compensation, or equalization, at different frequencies.

The sampling hold voltage (the basis for the VCO control voltage) may be varied by the input amplitude of the local oscillator signal applied to the hold circuit. For this reason, an amplitude compensation circuit (i.e. equalizer circuit) has been incorporated in the stage prior to the hold circuit.

This equalizer amplifier "equalizes" the amplitude by utilizing the slope of the FET-equipped amplifier resonance characteristics.

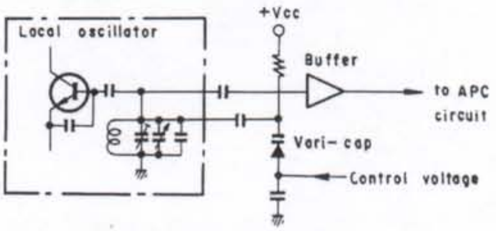


Fig. 6-10 VCO Circuit

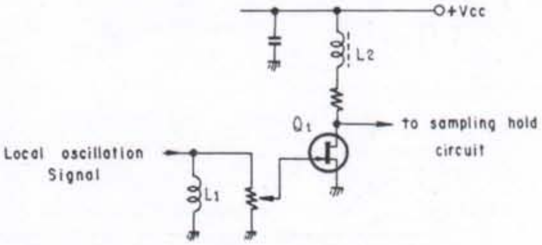


Fig. 6-11 Equalizer Amplifier

6.1.6 Structure of APC Control Circuit

An outline of the APC control circuit is shown in Fig. 6-12 below.

Beat Detector I

This circuit is AC coupled to the output of the sampling hold circuit. Any beat components in the sampling hold signal are amplified and rectified, and presented as DC voltage signals.

When the local oscillator signal is an integer multiple of 100kHz, there will be no output (DC voltage) from this circuit because there will be no beat components. Whenever the frequency deviates from an integer multiple, beats will occur, and an output signal will be generated.

Beat Detector II

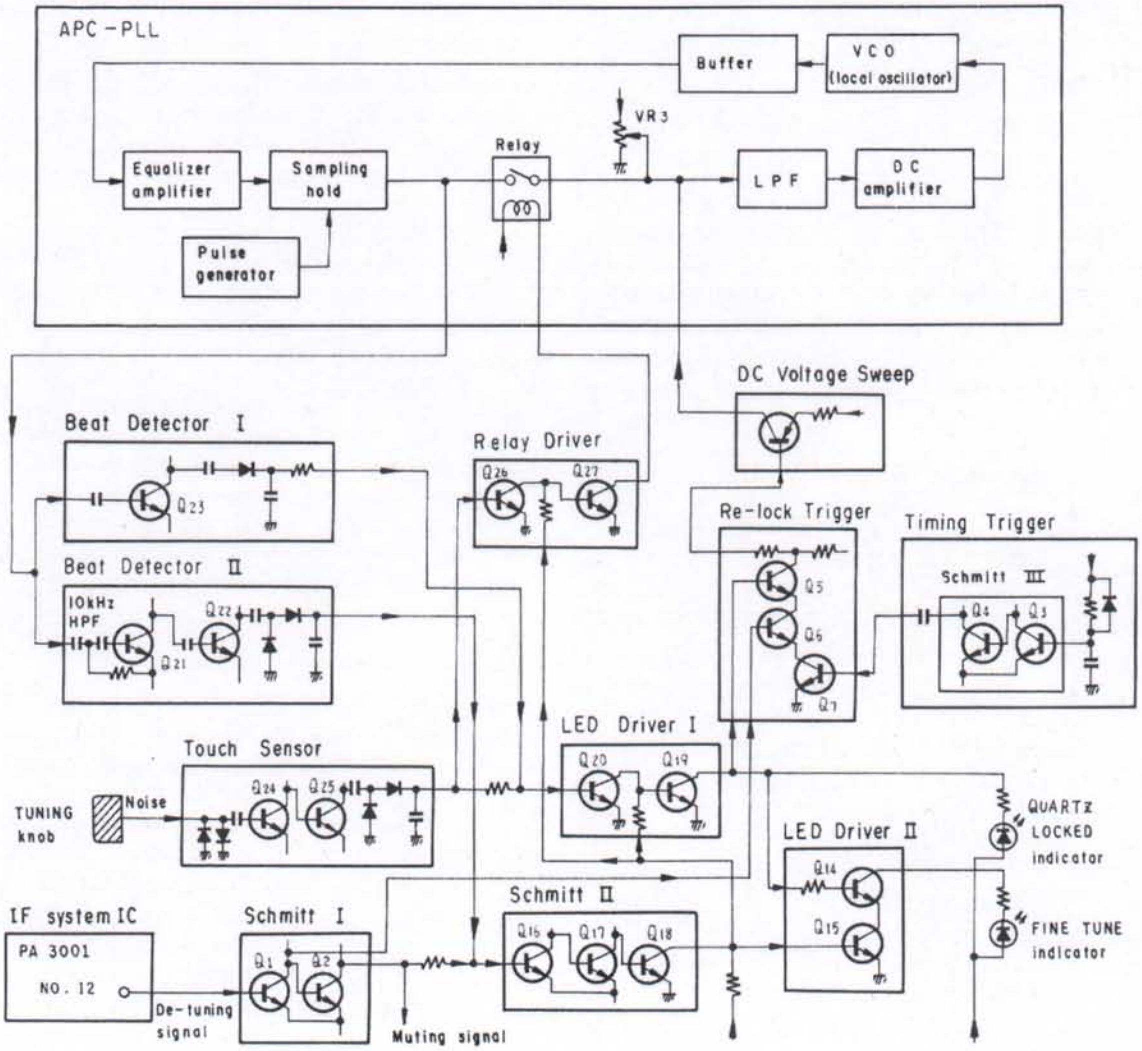
After the sampling hold signal is passed through a high-pass filter (fc = 10kHz), and consequently amplified and rectified, this second beat detector circuit detects beat components (as DC voltage) above 10kHz.

If the frequency of the local oscillator signal deviates by less than ±10kHz from the integer multiple of 100kHz, there will be no output. However, once the deviation exceeds ±10kHz, this circuit will produce a DC voltage output signal. Since the capture range of this APC circuit is greater than ±10kHz, the APC-PLL system may be locked as soon as the Beat Detector II output disappears.

Touch Sensor

The purpose of this circuit is to detect whether the TUNING knob is in contact with the user's hand or not. The noise voltages generated within the user's hand or not. The noise voltages generated within the human body, and relayed via the TUNING knob, are detected by the touch sensor circuit, and subsequently amplified and rectified into a DC output. In other words, whenever the user's hand is in contact with the TUNING knob, this circuit will produce an output.

Note, however, that mis-operation of this circuit may occur under the following circumstances:


APC－PLL
Buffer
VCO
(local oscillator)
VR3
Relay
Equalizer amplifier
Sampling hold
Pulse generator
LPF
DC amplifier
DC Voltage Sweep
Beat Detector I
Q23
Beat Detector II
10kHz HPF
Q21
Q22
Relay Driver
Q26
Q27
Re-lock Trigger
Q5
Q6
Q7
Timing Trigger
Schmitt III
Q4
Q3
Touch Sensor
Q24
Q25
TUNING knob
Noise
LED Driver I
Q20
Q19
LED Driver II
Q14
Q15
QUARTZ LOCKED indicator
FINE TUNE indicator
IF system IC
PA 3001
NO. 12
De-tuning signal
Schmitt I
Q1
Q2
Schmitt II
Q16
Q17
Q18
Muting signal

6-12 Outline of APC Control Circuit

1. A strong electromagnetic source located close to the receiver—due to noise voltages induced in the knob.
2. User makes contact with the knob and front panel simultaneously—due to reduction of noise voltages generated in the human body.
3. User makes contact with TUNING knob while wearing gloves or other similar apparel—in this case the touch sensor circuit is not capable of detecting the noise voltage.

Schmitt I

This Schmitt circuit is designed to invert during de-tuning. A DC voltage appears at no.12 pin of the IF system IC (PA3001-A) whenever there is more than ±70kHz detuning, or the input level is very weak (less than 10μV antenna input conversion), which is applied to the input of this circuit. On the output side, however, two different types of "outputs" are employed. The negative output (no output when input signal is applied) is passed to the Re-lock Trigger Circuit, and the positive output (output produced when input signal is applied) is connected to the Schmitt II circuit.

Schmitt II

This circuit is a Schmitt plus inversion circuit which produces an output when there is no output from either the Beat Detector II or Schmitt I circuits. That is, a DC voltage output is produced only when the frequency of the received signal is within ±10kHz of the frequency of the broadcasting station (which is an integer multiple of 100kHz).

Relay Driver Circuit

When there is an output from the Schmitt II circuit, but none from the Touch Sensor (which means that the broadcasting station frequency—an integer multiple of 100kHz—has been tuned to within ±10kHz, and the hand removed from the TUNING knob), this relay will activate to lock the APC-PLL system. So with the appearance of the Schmitt II output, and because the local oscillator frequency lies within the APC-PLL capture range, the loop will be completed, and the received frequency tuned exactly, and locked, to the frequency of the broadcasting station. There are actually two sets of contacts in this relay, the second pair being used to complete the TUNING meter circuit. The TUNING meter is consequently moved to dead center by activation of this relay.

LED Driver I

When there is no output from either Touch Sensor or Beat Detector II circuits, the appearance of the Schmitt II output also activates this LED driver I circuit, which then lights up the QUARTZ LOCKED indicator to show that the APC-PLL system has been locked.

LED Driver II

The LED driver II circuit lights up the FINE TUNE indicator. This will occur when there is an output from the Schmitt II circuit, and from the Touch Sensor and Beat Detector I circuits, indicating that the broadcasting station frequency (integer multiple of 100kHz) has been tuned to within ±10kHz of the station's center frequency. If the hand is then removed from the TUNING knob, the relay is activated, and the APC-PLL system brought into play, and the QUARTZ LOCKED indicator lights up. Therefore, the FINE TUNE indicator will turn off.

DC Voltage Sweep

The purpose of this circuit is to forcibly raise the APC control voltage by means of a signal applied by the Re-lock Trigger circuit.

Timing Trigger

When the power supply is first turned on, this Timing Trigger generates as slightly delayed pulse signal.

Re-lock Trigger

When there is no de-tuning signal applied to the IF system IC (PA3001-A), but still an output from Beat Detector I (i.e. a tuned frequency separated from the station's center frequency by ±10kHz to ±70kHz), and a pulse signal applied from the Timing Trigger, this Re-lock Trigger circuit sends a pulse signal to the DC Voltage Sweep circuit.

6.1.7 APC Control Circuit Operation

Operation During Tuning Procedure

1. While turning the TUNING knob (but still more than ±70kHz away from the station frequency), a de-tuning output signal from the IF system IC (PA3001-A) inverts the Schmitt I circuit, but there is no output from the Schmitt II circuit; however because the TUNING knob is being handled, there is an output from the Touch Sensor circuit. Therefore, the APC circuit relay will be open, and the FINE TUNE and QUARTZ LOCKED indicators will both remain off.

2. When the broadcasting station frequency is tuned to within ±10kHz ~ ±70kHz of the center frequency, there will no longer be an output from the IF system IC, but because of the output (DC voltage) from Beat Detector II, there will still be no Schmitt II output. The Touch Sensor will still produce an output, and the APC circuit relay will still be open. Therefore, neither the FINE TUNE nor QUARTZ LOCKED indicators, will light up at this stage.
3. When the broadcasting station has been tuned to within ±10kHz, the Beat Detector II output will stop, the Schmitt II output appear. And there also be a Touch Sensor output, the FINE TUNE indicator will light up.
4. When the hand is then removed from the TUNING knob (with the station tuned to within ±10kHz), the Touch Sensor output stops; but because of the Schmitt II output, the APC circuit relay will be closed, thereby activating the PLL circuit. Since the received frequency is now within the PLL capture range, the PLL will lock. The Beat Detector I output will consequently cease, resulting in the QUARTZ LOCKED indicator is turning on and the FINE TUNE indicator is turning off.

Re-lock Operation

If the power supply was turned off after once tuning into a particular broadcasting station (and the APC-PLL system locked), and then turned on again, the APC-PLL system would not necessarily automatically re-lock again without this Re-lock function, since the APC-PLL capture range is narrower than the lock range.

When the power supply is turned on, the local oscillator frequency sweeps from high frequency downwards towards the stationary status frequency. If the PLL lock status was either within the capture range or below the lower limit when the power supply was turned off, this local oscillator frequency sweep will have to pass through that capture range frequency again when the power supply is turned on; so in this case, the PLL would be locked to that former frequency.

On the other hand, however, if the PLL lock status was above the upper limit of the capture range when the power supply was last turned off, the local oscillator frequency sweep would not reach the former capture range frequency when the power supply was turned on again. Therefore, the PLL would not be capable of re-locking to the former frequency. For this reason, the local oscillator frequency is fallen forcibly in order to make the sweep pass through the former capture range frequency, this being achieved by raising the control voltage of the VCO.

The Timing Trigger circuit slightly generates a pulse output after the power supply is turned on. If the tuned frequency is within the −70kHz to +10kHz range at this time, the APC-PLL system will lock before the pulse signal leaves the Timing Trigger circuit, and there will be no Re-lock Trigger circuit pulse output.

If the tuned frequency lies within the +10kHz to +70kHz range of the station's center frequency when the power supply is turned on again, a pulse signal from the Re-lock Trigger circuit will activate the DC Voltage Sweep circuit which serves as a switching circuit for the DC power supply. Activation of this circuit results in the application of a DC voltage to the PLL circuit. The VCO control voltage is thus raised, thereby falling the local oscillator frequency temporarily.

6.1.8 AM Tuner Stage

The AM tuner employs a 3-ganged variable capacitor coupled to an IC (HA1197) which incorporates a 1-stage RF amplifier, a 2-stage IF amplifier, and the detector (see Fig. 6-13 below).

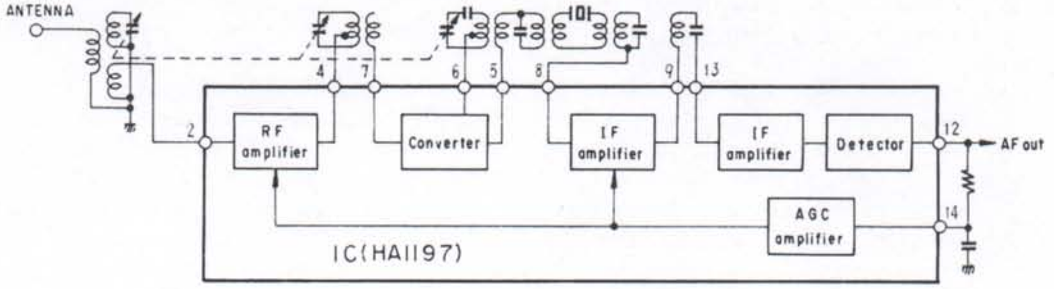


Fig. 6-13 AM Tuner Section

6.2 PREAMPLIFIER SECTION

6.2.1 Phono Circuits

Cartridge Load Selectors

The input resistance and input capacitance of the PHONO 1 input may be varied. The equalizer amplifier input resistance is set to 100kΩ, and the input capacitance to 100pF. By operation of the CARTRIDGE LOAD selectors, different resistors and capacitors will be inserted in parallel with the PHONO 1 input circuit. Three different input resistance levels (10kΩ, 50kΩ, and 100kΩ) and four different input capacitance levels (100pF, 200pF, 300pF, and 400pF) are available, permitting the user to select optimum load conditions for the phono cartridge being employed in the turntable connected to the PHONO 1 terminals.

Microphone Input Circuit

When a microphone is plugged into the MIC jack, the PHONO 2 input circuit (both L and R channels) is connected to the microphone input circuit. Since the equalizer amplifier also serves as the microphone amplifier, the frequency response of the microphone input circuit is designed to be the inverse of that of the equalizer amplifier, thereby obtaining a final flat frequency response.

NOTE:
When the microphone is plugged into the MIC jack, the PHONO 2 terminals will be open, and will not be available for use as a phono input.

Phono Interference Filter

Because of the high sensitivity of the phono input circuits, a certain amount of radio frequency interference may occur. This may be reduced by simply turning the rear panel PHONO INTERFERENCE FILTER on (thereby connecting a resistor in series with the phono input circuits).

Equalizer Amplifier

The first stage of the equalizer amplifier (see Fig. 6-14) features a recently developed ultra-low-noise twin FET (Q_1, 2SK131) and a differential amplifier formed by two NPN transistors (Q_2 and Q_3) in a cascade connection, with the load circuit forming a current mirror (Q_4 and D_1) circuit.

This cascade connection helps to keep the FET drain to scource voltage at a low level, thereby suppressing the noise level in the gate current. The FET load impedance is also lowered, consequently avoiding the deterioration in the high and frequency response caused by the drain to gate reverse transfer capacitance (Miller effect). Furthermore, the current mirror action serves to operate this stage in push-pull mode, thereby eliminating the even-numbered harmonics, as well as doubling the gain.

The following stage (Q_5) makes the load circuit a constant-current source (Q_6), thereby obtaining a high voltage gain.

The output stage is a symmetrical complementary SEPP (Q_7 and Q_8), while the RC network consists of metal film resistors (deviation of less than ±1%) and polypropylene film capacitors (deviation of less than ±2%).

The major specifications of this circuit are (1) S/N ratio of 87dB, (2) input level of 300mV (THD 0.03%), and (3) equalization deviation of ±0.2dB (20Hz to 20,000Hz).

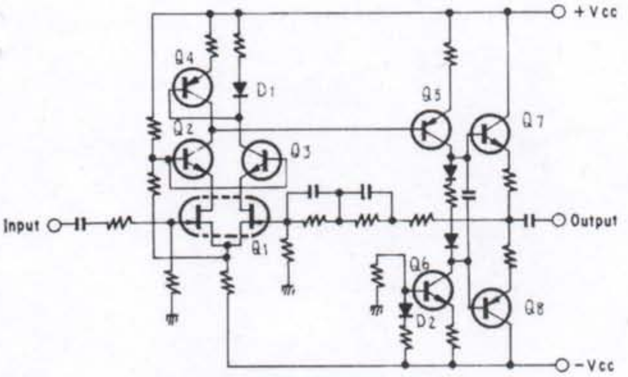


Fig. 6-14 Equalizer Amplifier

6.2.2 Flat Amplifier

The flat amplifier, located just prior to the tone control circuit, amplifies signals to the required level (gain: 22.5dB), and passes the signals on to the tone contorl circuit at low impedance. The first stage of this 3-stage direct-coupled amplifier (see Fig. 6-15) is a PNP dual-transistor differential amplifier, and the output stage is a complementary symmetrical SEPP circuit.

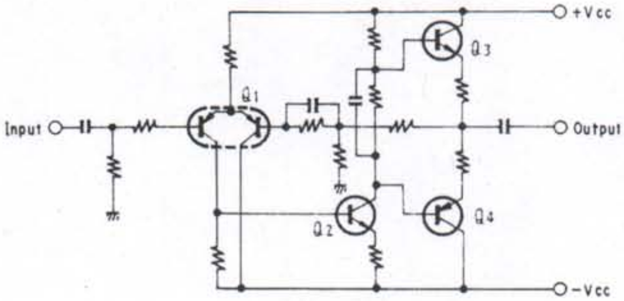


Fig. 6-15 Flat Amplifier

6.2.3 Tone Controls

The SX-1980 features two pairs of tone control circuits (twin tone controls), each with a different turnover frequency. The main tone controls are similar to other regular tone controls, while the sub tone controls permit variation of the frequency response at the very high and very low ends. Both main and sub tone controls apply C-B feedback to a single transistor amplifier, with frequency selection provided within the feedback loop, and the frequency response altered when these frequencies are changed.

All of these circuits may be by-passed by simply putting the TONE switch into the OFF position.

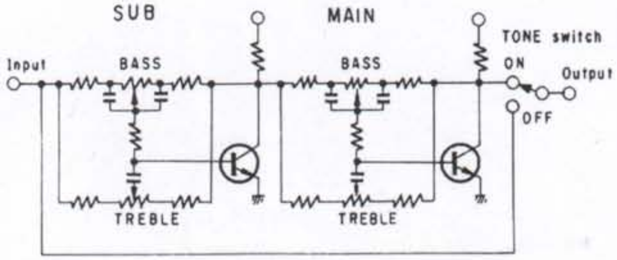


Fig. 6-16 Basic Circuitry of Tone Controls

6.2.4 Filter Circuits

The filters employed in this receiver are −12dB/ octave NFB-type active filters. By coupling the emitter-follower to RC passive filters, peaks have been obtained in the region of the cut-off frequencies, thereby sharpening the "knee characteristics" of the RC passive filters.

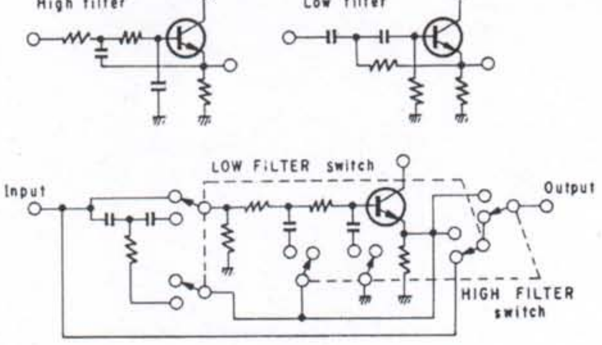


Fig. 6-17 Basic Circuitry of Filters

6.3 POWER AMPLIFIER SECTION

6.3.1 Amplifier Circuitry

See Fig. 6-18 for the basic outline of the power amplifier circuitry. The first stage is a differential amplifier formed by a cascade connection between the dual transistor (Q_2) and the PNP transistors (Q_3 and Q_4), while the load circuit forms a current mirror (Q_5 and Q_6) circuit. This cascade connection lowers the Q_2 load impedance, and prevents the deterioration of the high-end frequency response due to the collector-to-base reverse transfer capacitance (Miller effect). The current mirror serves to make this stage operate in push-pull mode, thereby eliminating the even numbered harmonics, and doubling the gain.

Q_1 in the input circuit has been designed to absorb the base current of Q_2 to prevent the appearance of a DC voltage across R_1. Since Q_1 and Q_2 are both transistors, any changes in base current due to heat will be the same, thereby maintaining the base voltage (DC) at 0 volts.

The pre-driver stage (Q_7) connects the load circuit to the constant-current source (Q_8 and D_1), thereby obtaining a high voltage gain.

The power stage ($Q_9 \sim Q_{18}$) is a 3-stage Darlington connection triple-SEPP capable of delivering 270 watts per channel at 8Ω (0.03% THD).

Because there are no low-end time constants in the NFB circuit (R_2, R_3), amplification down to the DC region becomes possible, resulting in an outstanding low-end frequency response. (Note, however, that DC inputs will be cut by the input coupling capacitor).

6.3.2 Drive Voltage Limiter

Saturation caused by over-driving of the power stage can cause abnormal functioning of the NFB circuit, resulting in a rather unstable performance. This kind of saturation is prevented in the SX-1980 by clipping the drive signal voltage for the power stage. The driver voltage limiter responsible for this operation consists of $D_4 \sim D_7$. The signal DC level is first shifted by D_2, D_3, and VR_2, and the bias voltage applied to the power stage. D_5 and D_6 further shift the signal DC level, and if the signal voltage is excessively high, D_4 and D_7 are employed to clip that level.

NOTE:
At high output levels, the value of Vcc1 will be lower than the value of Vcc2.

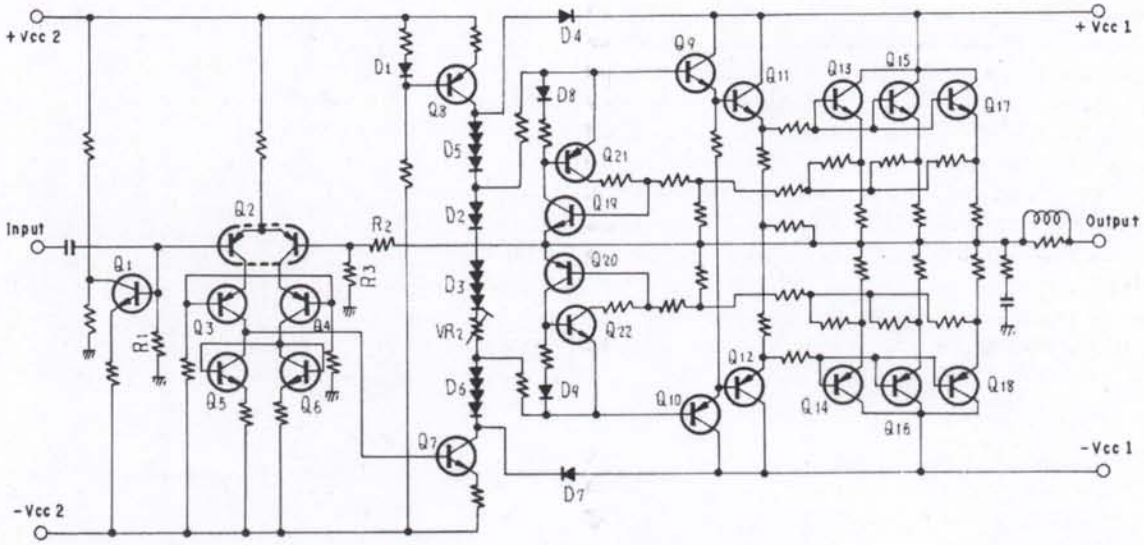

+Vcc 2
D1
Q8
D4
Q9
Q11
Q13
Q15
Q17
+Vcc 1
D8
D5
Q21
Q2
Q19
Input
R2
R3
D2
Output
Q1
Q20
D3
Q3
Q4
VR2
Q22
R1
Q12
Q5
Q6
D6
D9
Q10
Q14
Q16
Q18
Q7
-Vcc 1
D7
-Vcc 2

Fig. 6-18 Power Amplifier

6.3.3 Power Limiter

If high output power is employed with relatively low load impedances, the current flowing through the power transistors may reach dangerously high levels. In order to prevent such excessive flow of current, the output power is controlled by clipping the drive signal voltage level. This power limiter stage consists of $Q_{19} \sim Q_{22}$.

The bases of Q_{19} and Q_{20} are connected to the emitters of the power transistors. When a large current is passed through the power transistors, the voltage difference generated across the emitter resistance increases, resulting in the drive signal being passed through Q_{19} and Q_{20} where its voltage is clipped. Q_{21} and Q_{22} are linked to Q_{19} and Q_{20} in order to sharpen this clipping action.

The power limiter in this circuit will be activated when output power reaches approximately 300 watts for a 4Ω load.

6.3.4 Output Power Meters

The SX-1980 is equipped with a pair of output power meters which read peak power values from 0.01 to 540 watts (when driving an 8Ω load) without the need to switch range scale. The drive circuit for these meters is outlined in Fig. 6-19.

Logarithmic Compression Circuit

This circuit employs the relation between the voltage applied across a diode, and the forward resistance. See Fig. 6-20 for the basic logarithmic compression circuit. The forward resistance through D_1 is large when the input voltage Vin applied across D_1 is very small, but decreases as (Vin) is increased. The relation between Vin and Vout of this circuit is almost logarithmic, as can be seen from Fig. 6-21.

In actual circuits, a single diode is insufficient to provide an adequate compression range, so 3 diodes are employed, each activated in turn at different levels. The composite result is the attainment of the required compression range.

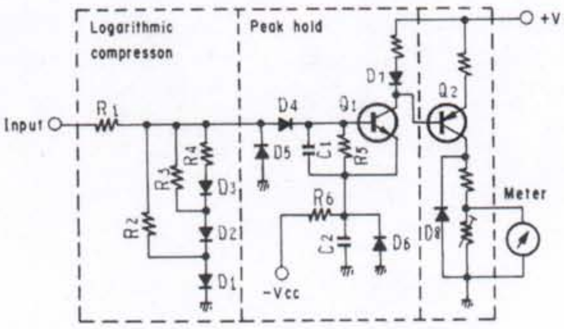

Logarithmic compresson
Peak hold
+Vcc
D7
Q2
Input
R1
D4
Q1
D5
C1
R5
R4
R3
D3
Meter
R6
R2
D2
C2
D6
D8
D1
-Vcc

Fig. 6-19 Meter Drive Circuit

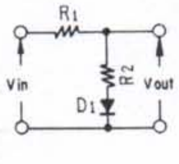

R1
Vin
R2
Vout
D1

Fig. 6-20

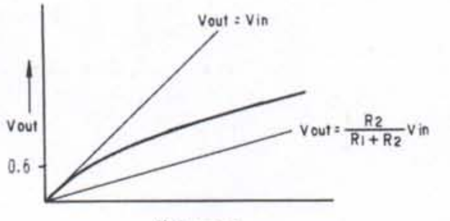


Fig. 6-21

Peak Hold Circuit

The signal from the logarithmic compression circuit is rectified, and then applied to C_1 which is consequently charged up. But since this capacitor is charged up very quickly, the signal voltage peak value is attained. Discharge is relatively slow (the discharge time constant being determined by R_5 and the base current on Q_1) permitting the meters sufficient time to indicate the peak value. R_6, C_2 and D_6 are designed to apply forward bias to D_4, thereby eliminating the leading edge portion of the D_4 rectification characteristics.

The meter drive circuit is also designed to drive the output power meters for positive peak signals only.

6.3.5 Protection Circuit

The purpose of this circuit is to protect both the speakers and the power amplifiers. The relay in the output circuit is automatically opened in any of the following cases:

1. During the "transient operations" when the power supply is turned on and off.
2. Upon detection of an overload, caused by a short circuit in the load.
3. Upon detection of a DC voltage in the output circuit, caused by component failure or accident.

An outline of this circuit is shown in Fig. 6-22. The relay-activating transistor (Qr) is controlled by the IC (PA3004).

Muting Operation When Power Supply is Turned Off and On

When the power supply is first turned on, the voltages on pins 1, 7, and 6 of PA3004 will exceed a prescribed level. If there is no input (DC) on pin no.4, S_2 will be off, and a charging current will commence to flow to the timing capacitor (Ct) connected to pin no.8. Once Ct has been charged up to a level where the voltage on pin no.8 exceeds a prescribed level, S_1 will turn on, thereby applying a bias current from pin no.3 to the relay driving transistor (Qr). Consequently, Qr will turn on, and current will flow through the relay coil to activate the relay, and close the connection in the output circuit. The time required for this connection to close after the power supply is first turned on is several seconds. During this period, any unwanted transient noises will be therefore muted.

When the power supply is turned off, the input (AC) applied to pin no.7 ceases immediately, resulting in S_2 turning on, Ct discharging rapidly, and S_1 and Qr both turning off. The relay is thus opened, disconnecting the output circuit.

DC Voltage Detector

The output circuit is connected to pin no.4 via a low-pass filter (R_8 and C_2). Any DC voltages appearing in the output circuit will also be applied to pin no.4, turning S_2 on. Ct will thus discharge rapidly, turning S_1 and Qr off, thereby releasing the relay, and disconnecting the output circuit from the load.

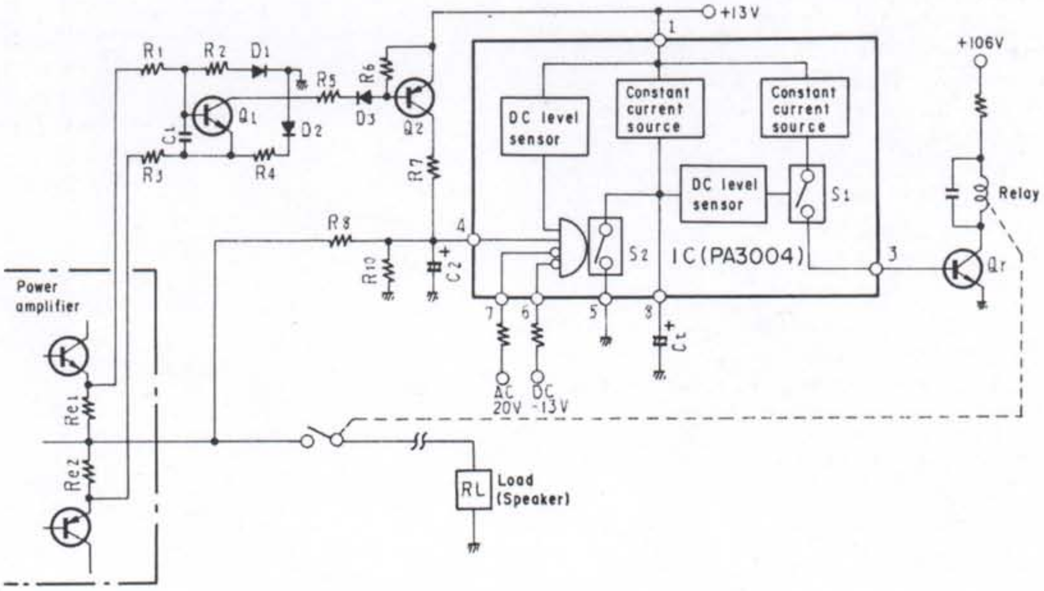
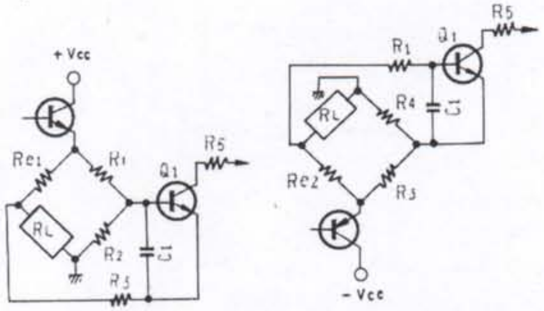


Fig. 6-22 Protection Circuit

Overload Detection

The overload detector circuit incorporates the load (RL) in one side of a Wheatstone bridge (see Fig. 6-23). The base and emitter of a sensing transistor (Q_1) are connected to the opposite corners of the bridge, so if RL decreases, Q_1 will become forward biased. If RL falls below a prescribed value, Q_1 will turn on, thereby passing a current through R_5, D_3 and R_6. Due to the voltage difference generated across R_6, Q_2 will become forward biased, and consequently turn on. A DC voltage will then be applied to pin no.4, turning S_2 on, and resulting in the rapid discharge of Ct, and S_1 and Qr both turning off. The relay will again be released to disconnect the output circuit.



(a) Positive half cycle bridge (b) Negative half cycle bridge

Fig. 6-23 Overload Detector Circuit

6.4 POWER SUPPLY CIRCUIT

6.4.1 DC Power Supply Circuit

The secondary windings of the power transformer in the power stage are separated into independent left and right channels. The power for each side is supplied via independent bridge rectifiers and a pair of 22,000μF capacitors. The tuner section, preamp section, and the voltage amplification stage of the power amp are supplied by full-wave rectifiers and voltage regulators from a winding different from that used for the power stage. The position indicator lamps are also supplied with DC power from the regulated power supply to ensure stable illumination.

6.4.2 Surge Current Suppressor Circuit

Since the SX-1980 employs a large toroidal power transformer and four 22,000μF capacitors in the power supply circuit, the sudden surge of current when the power supply is turned on may reach several hundred amperes. The surge current suppressor circuit used to reduce this sudden surge is shown in Fig. 6-24.

When the POWER switch (S_1) is OFF (i.e. no supply of AC power), the relay contact (S_2) is open. But when this switch (S_1) is turned ON, the sudden surge of current is passed through R_1, thereby greatly reducing the flow of current. When the output DC voltage of the power supply circuit reaches a certain prescribed level, S_2 will close, and R_1 consequently be by-passed. The time required for this to occur, however, is considerably shorter than the time required for the muting circuit to operate when the power supply is turned on, so there is no undue effect upon normal operation of the receiver.

TF_1 is a temperature-sensitive fuse coupled to R_1. If S_2 fails to close due to an abnormality in the power supply circuit or relay, the heat generated in R_1 will cause TF_1 to blow, thereby opening the primary circuit.

When the POWER switch (S_1) is turned OFF, the relay driving circuit is opened, thereby opening S_2 and the primary circuit.

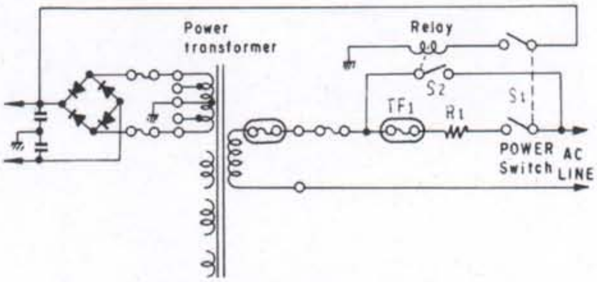


Fig. 6-24 Surge Current Suppressor Circuit

7. DISASSEMBLY

Top Plate

Remove the four screws (❶~❹) to detach the top plate.

Wooden Cover

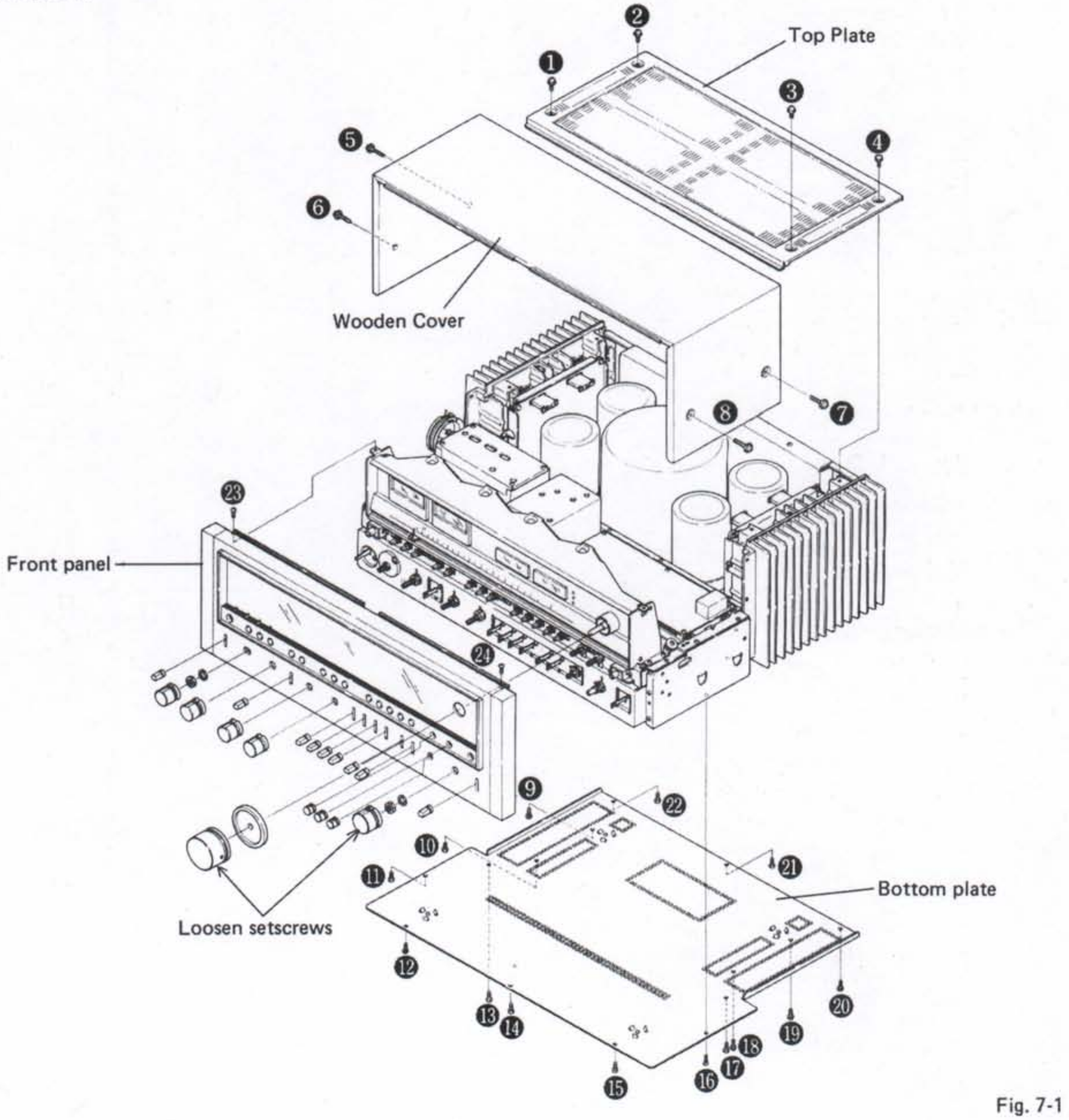
Remove the two screws on each side of the wooden cover (❺ ~ ❽).

Bottom Plate

Remove the fourteen screws (❾ ~ ㉒) to detach the bottom plate.

Front Panel

Loosen the setscrews of TUNING and VOLUME knobs with a hexagonal wrench. Remove all the knobs by pulling. Remove the two screws (㉓, ㉔) from the top edge of the front panel. Remove the two nuts from the control shafts.



❷
Top Plate
❶
❸
❺
❹
❻
Wooden Cover
❽
❼
㉓
Front panel
㉔
❾
㉒
❿
⓫
㉑
Bottom plate
Loosen setscrews
⓬
⓭
⓮
⓲
⓳
⓴
⓯
⓰
⓱

Fig. 7-1

Heat Sink

Remove the two screws (㉕, ㉖) to detach the terminal guard. Remove the four screws (㉗ ~ ㉚).

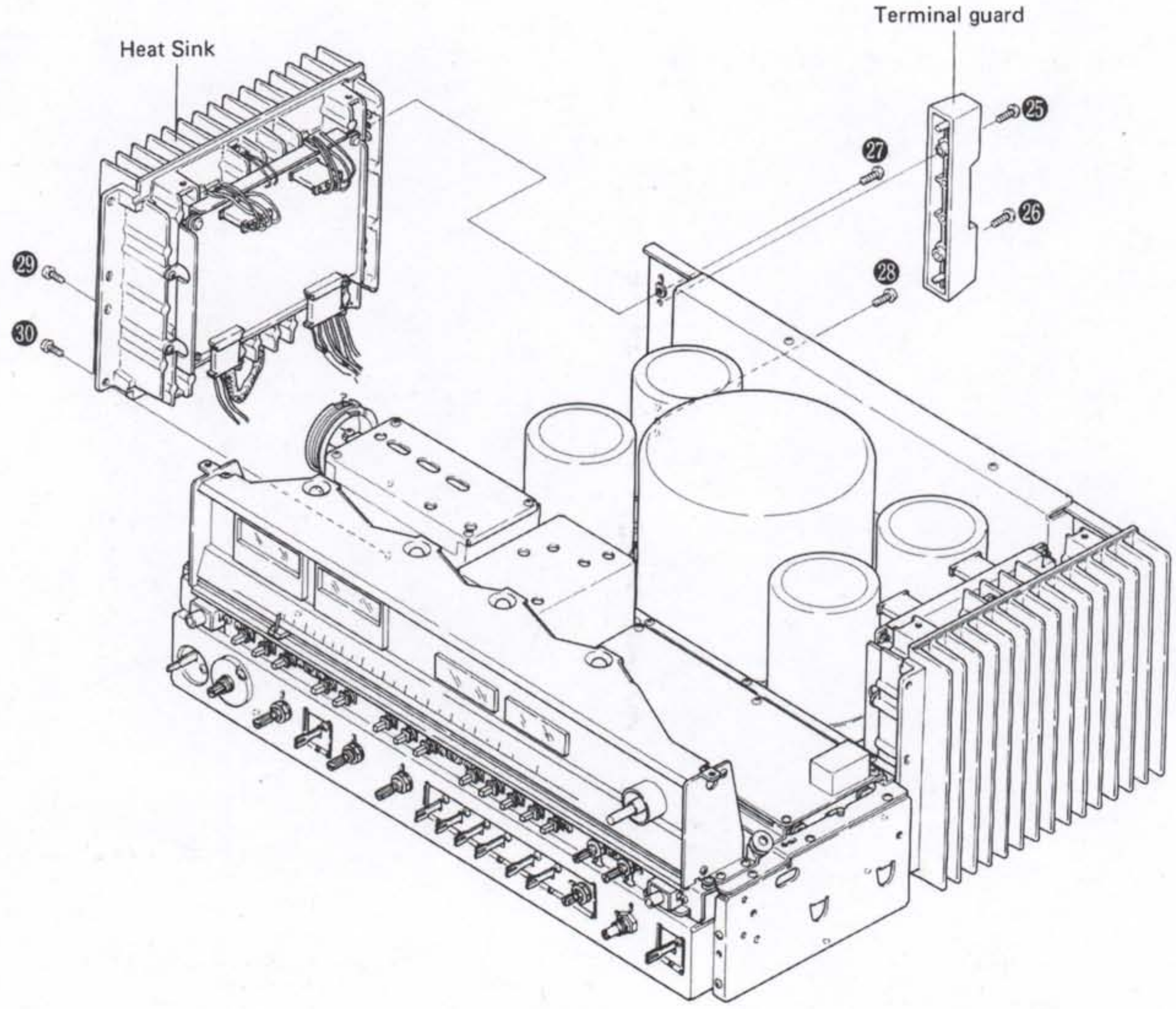
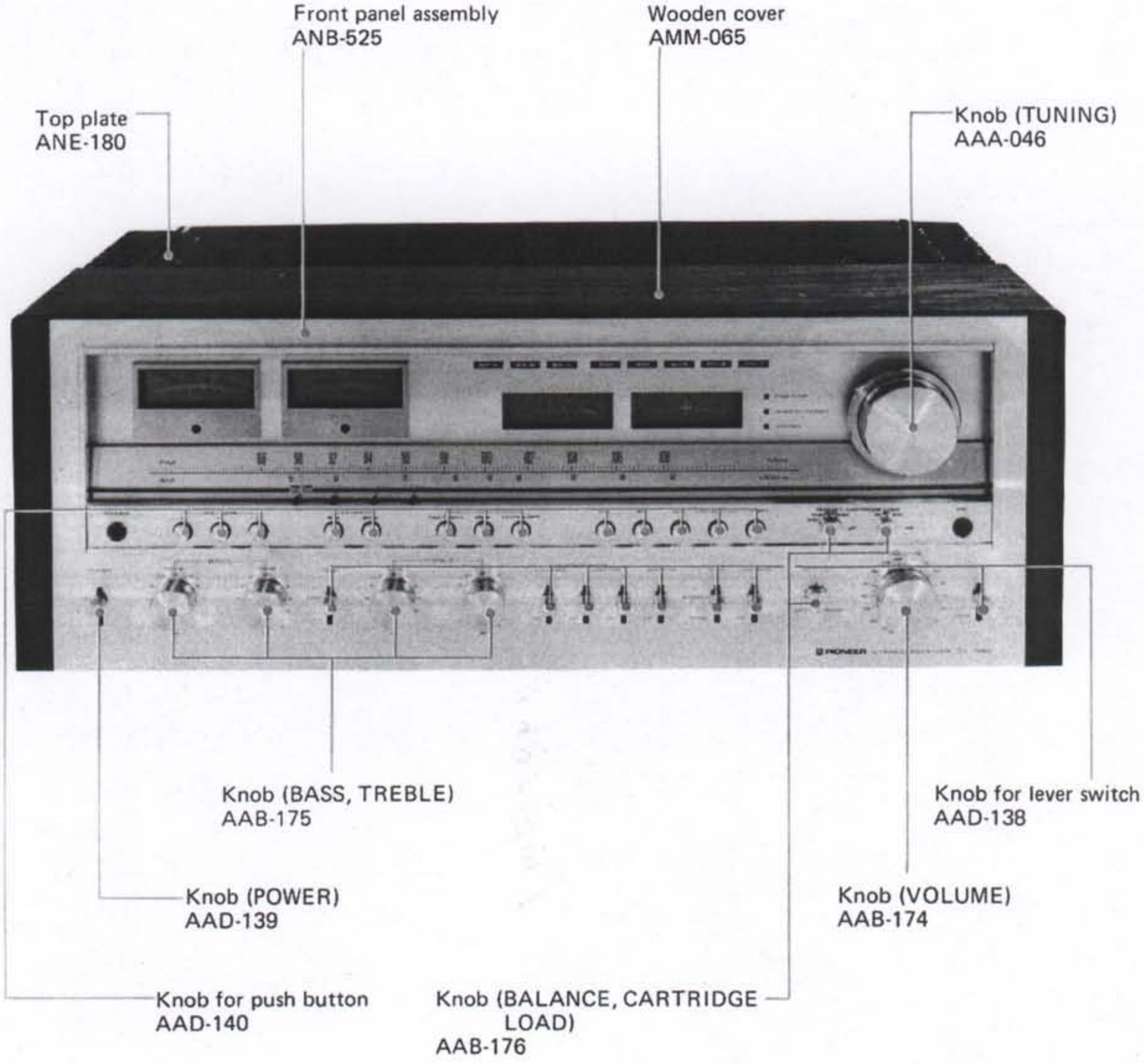

Terminal guard
Heat Sink
㉕
㉗
㉖
㉘
㉙
㉚

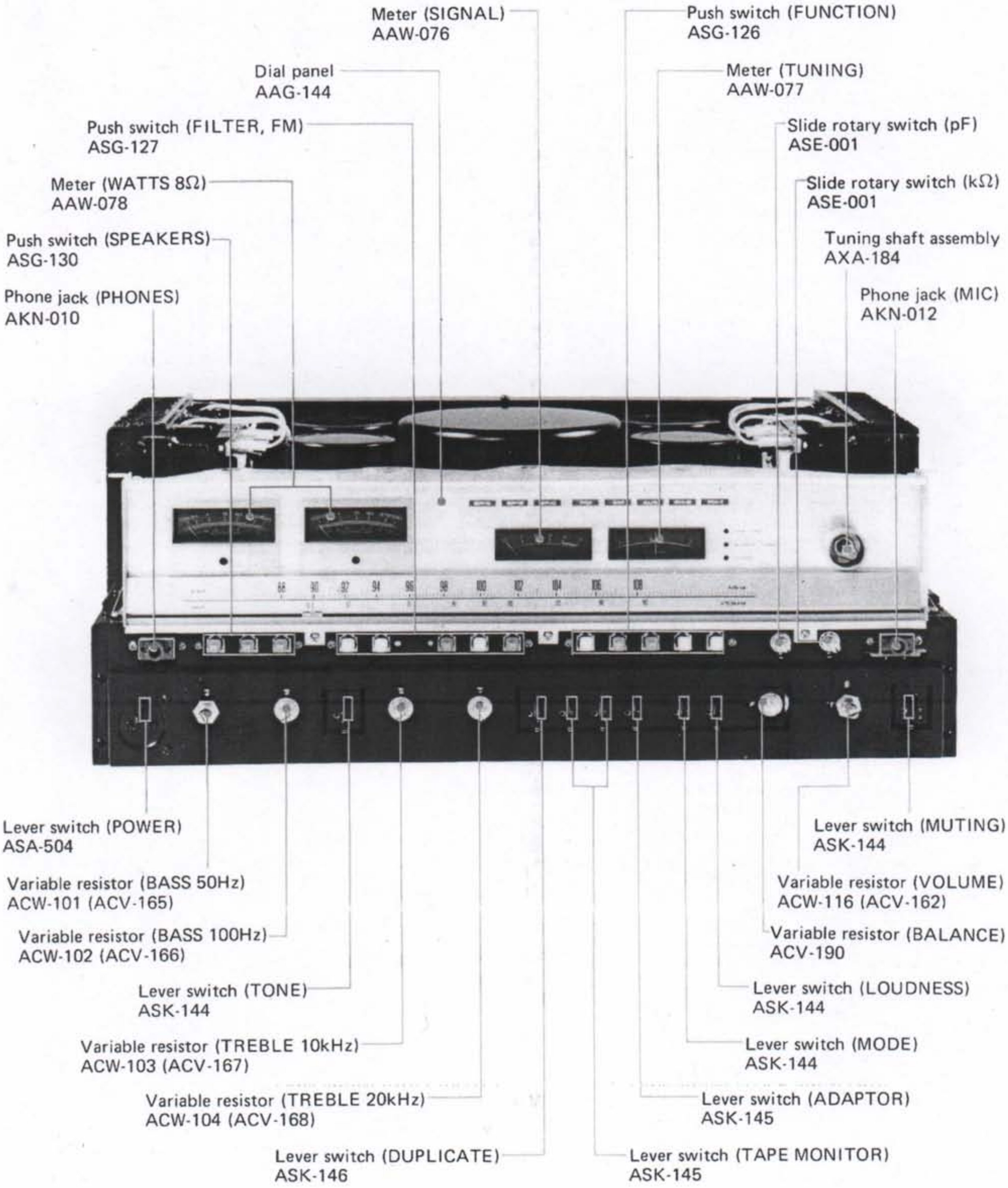
Fig. 7-2

8. PARTS LOCATION

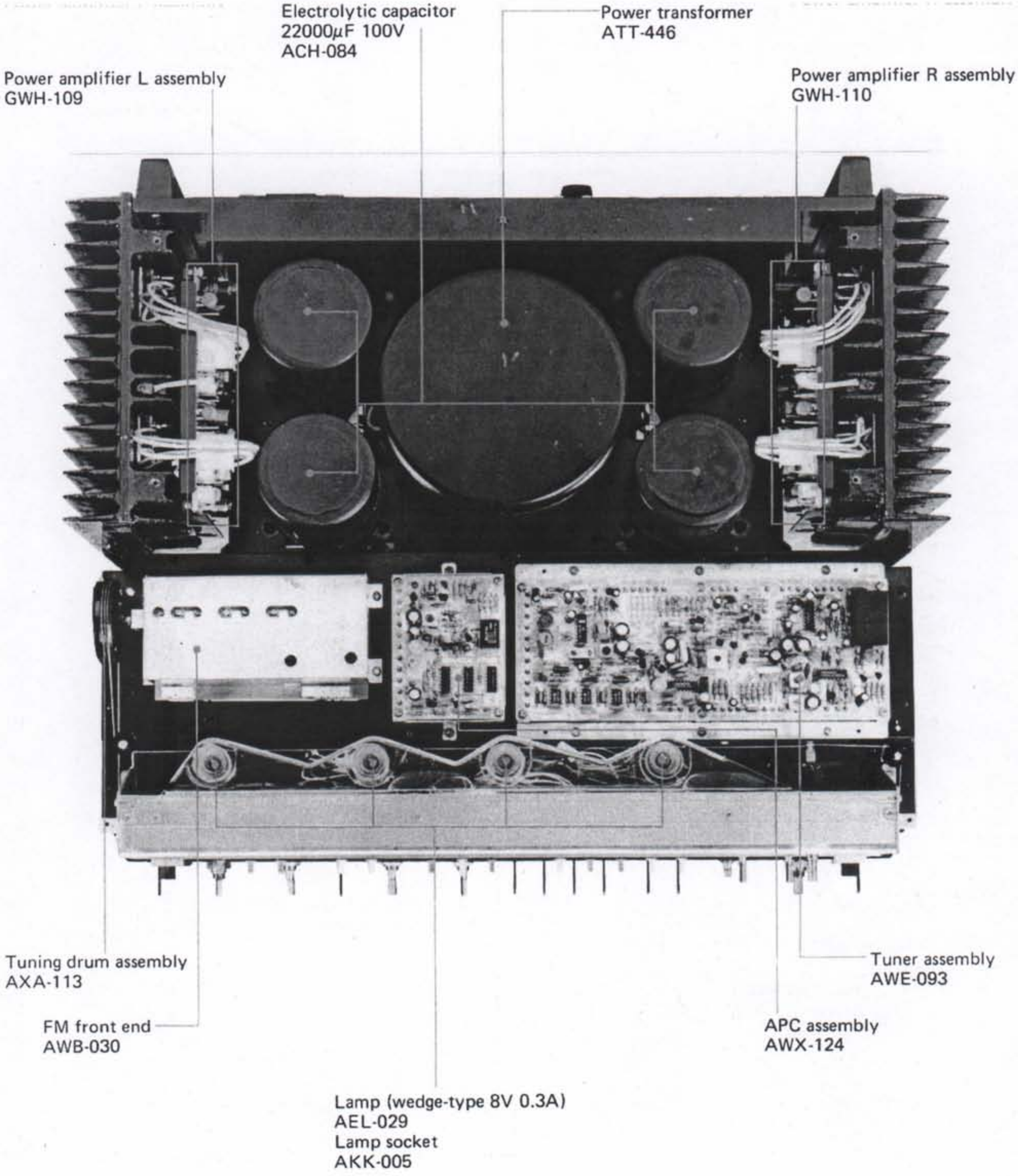
8.1 FRONT PANEL VIEW


Front panel assembly
ANB-525
Wooden cover
AMM-065
Top plate
ANE-180
Knob (TUNING)
AAA-046
Knob (BASS, TREBLE)
AAB-175
Knob for lever switch
AAD-138
Knob (POWER)
AAD-139
Knob (VOLUME)
AAB-174
Knob for push button
AAD-140
Knob (BALANCE, CARTRIDGE LOAD)
AAB-176

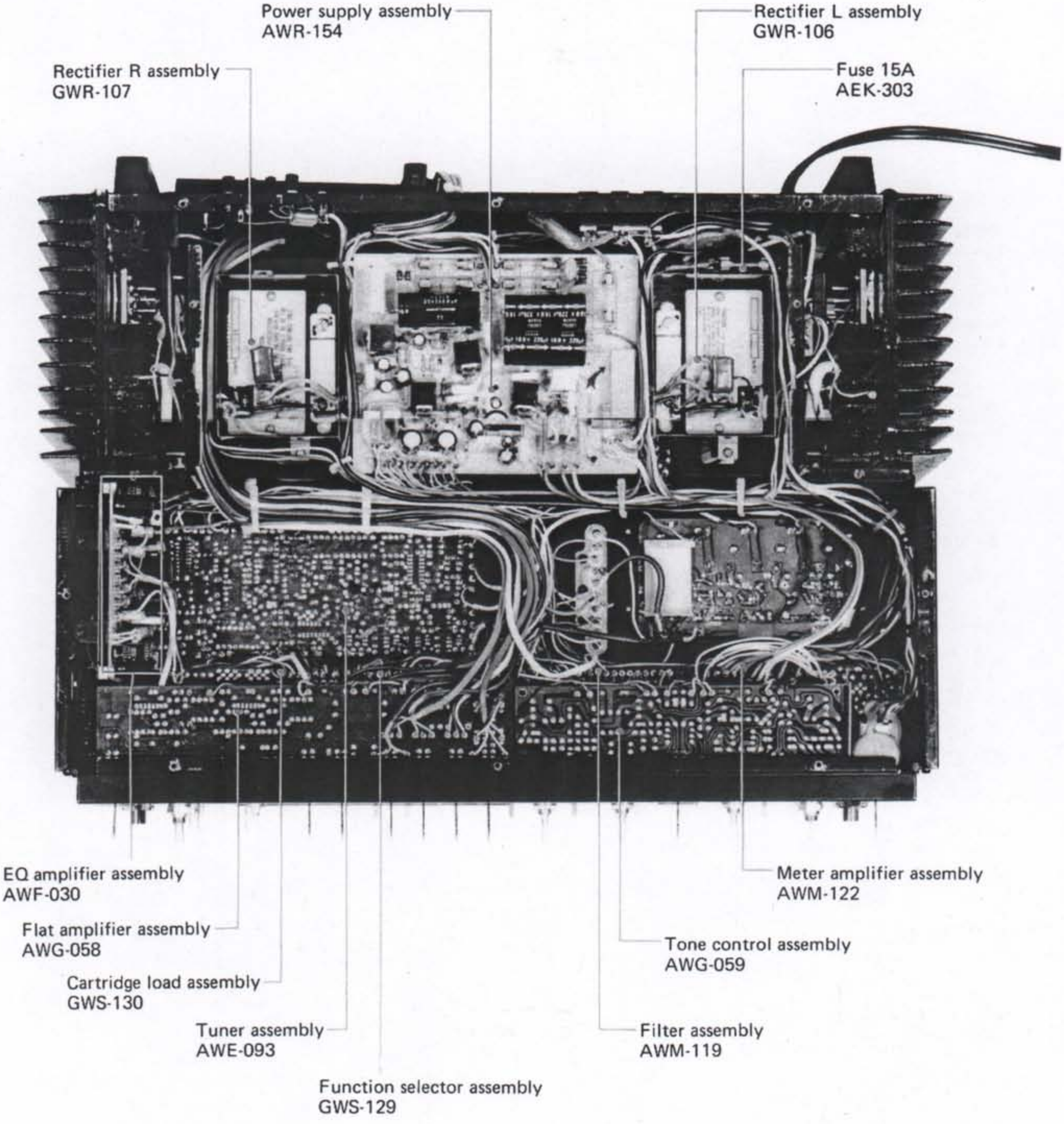
8.2 FRONT VIEW WITH PANEL REMOVED


Meter (SIGNAL) AAW-076
Dial panel AAG-144
Push switch (FILTER, FM) ASG-127
Meter (WATTS 8Ω) AAW-078
Push switch (SPEAKERS) ASG-130
Phone jack (PHONES) AKN-010
Push switch (FUNCTION) ASG-126
Meter (TUNING) AAW-077
Slide rotary switch (pF) ASE-001
Slide rotary switch (kΩ) ASE-001
Tuning shaft assembly AXA-184
Phone jack (MIC) AKN-012
Lever switch (POWER) ASA-504
Variable resistor (BASS 50Hz) ACW-101 (ACV-165)
Variable resistor (BASS 100Hz) ACW-102 (ACV-166)
Lever switch (TONE) ASK-144
Variable resistor (TREBLE 10kHz) ACW-103 (ACV-167)
Variable resistor (TREBLE 20kHz) ACW-104 (ACV-168)
Lever switch (DUPLICATE) ASK-146
Lever switch (MUTING) ASK-144
Variable resistor (VOLUME) ACW-116 (ACV-162)
Variable resistor (BALANCE) ACV-190
Lever switch (LOUDNESS) ASK-144
Lever switch (MODE) ASK-144
Lever switch (ADAPTOR) ASK-145
Lever switch (TAPE MONITOR) ASK-145

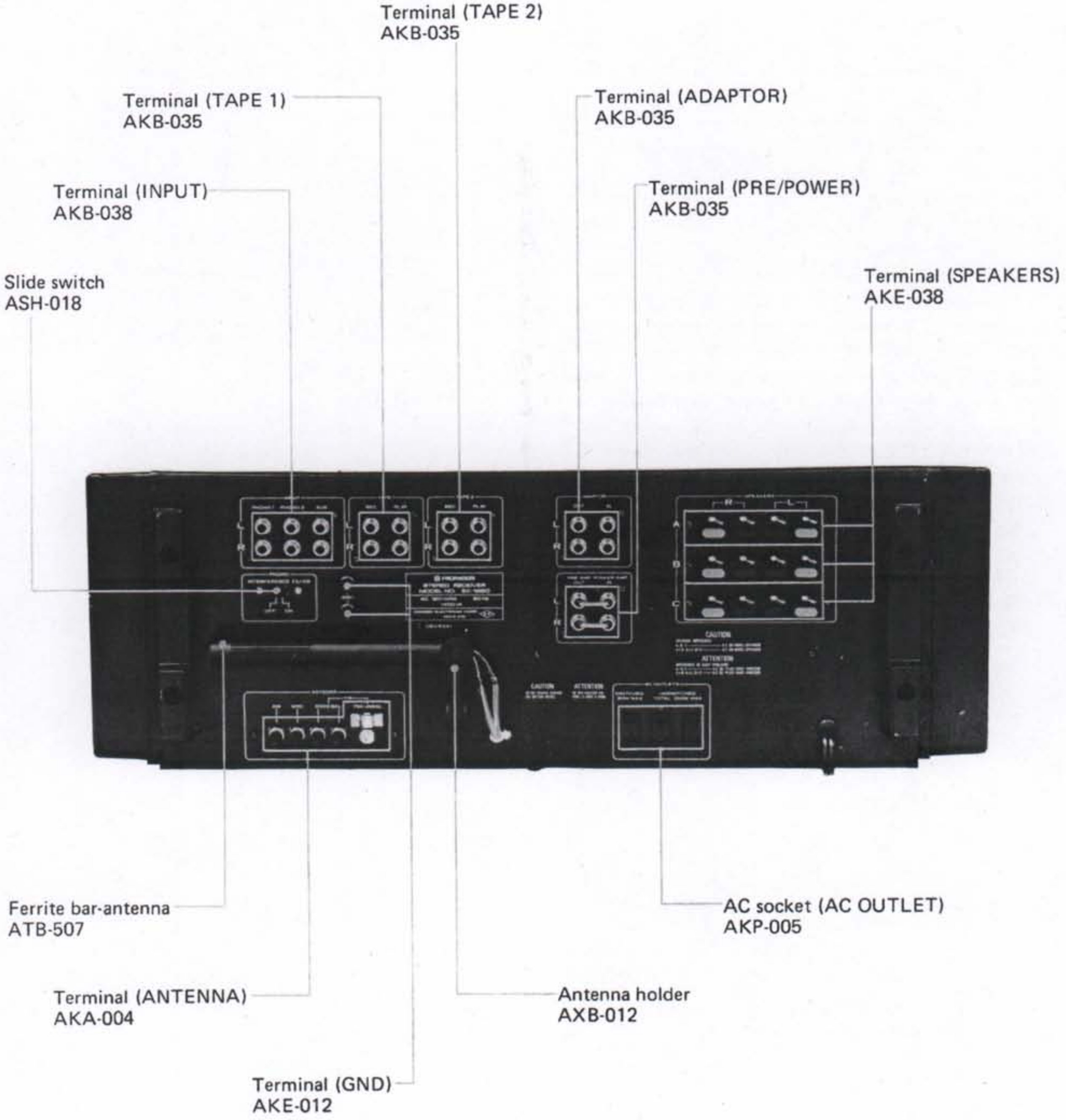
8.3 TOP VIEW


Electrolytic capacitor
22000μF 100V
ACH-084
Power transformer
ATT-446
Power amplifier L assembly
GWH-109
Power amplifier R assembly
GWH-110
Tuning drum assembly
AXA-113
FM front end
AWB-030
Tuner assembly
AWE-093
APC assembly
AWX-124
Lamp (wedge-type 8V 0.3A)
AEL-029
Lamp socket
AKK-005

8.4 BOTTOM VIEW


Power supply assembly
AWR-154
Rectifier R assembly
GWR-107
Rectifier L assembly
GWR-106
Fuse 15A
AEK-303
EQ amplifier assembly
AWF-030
Flat amplifier assembly
AWG-058
Cartridge load assembly
GWS-130
Tuner assembly
AWE-093
Function selector assembly
GWS-129
Meter amplifier assembly
AWM-122
Tone control assembly
AWG-059
Filter assembly
AWM-119

8.5 REAR PANEL VIEW


Terminal (TAPE 2)
AKB-035
Terminal (TAPE 1)
AKB-035
Terminal (ADAPTOR)
AKB-035
Terminal (INPUT)
AKB-038
Terminal (PRE/POWER)
AKB-035
Slide switch
ASH-018
Terminal (SPEAKERS)
AKE-038
Ferrite bar-antenna
ATB-507
AC socket (AC OUTLET)
AKP-005
Terminal (ANTENNA)
AKA-004
Antenna holder
AXB-012
Terminal (GND)
AKE-012

9. DIAL CORD STRINGING

1. Remove the wooden cover and front panel.
2. Undo the 3 screws to remove the blind sash (see Fig. 9-1).
3. Turn the tuning drum around in the clockwise direction (as viewed from the X direction in Fig. 9-4) as far as it will go.
4. Loosen the screw securing the tuning drum, and then remove the drum from the tuning capacitor.
5. Tie one end of the dial cord to the stud located on the inside of the tuning drum, and lead the cord out through the cut-out section.
6. Turn the tuning drum around on the tuning capacitor shaft so that the setscrew faces directly upwards.
7. Pass the dial cord around pulley A, and wind it 3 times around the tuning shaft in a clockwise direction (as viewed from the rear panel).
8. Then pass the dial cord around pulleys B, C and D in order, make 2½ winds around the tuning drum, pull the cord taught, and finally tie it to the spring hook.
9. Turn the TUNING knob back and forth to check that the dial cord moves smoothly and efficiently. Then cut off any excess dial cord remaining.
10. Next turn the TUNING knob in a counterclockwise direction as far as it will go, and attach the dial pointer to the dial cord so that the pointer reads 87MHz (see Fig. 9-3).
11. Paint-lock the knots on the string.

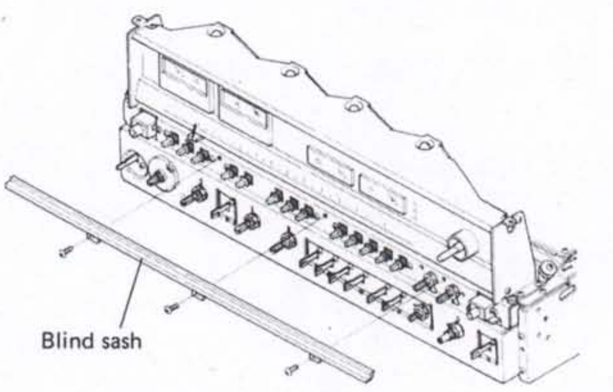


Fig. 9-1

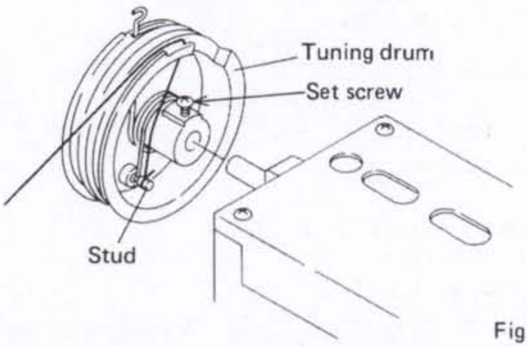


Fig. 9-2

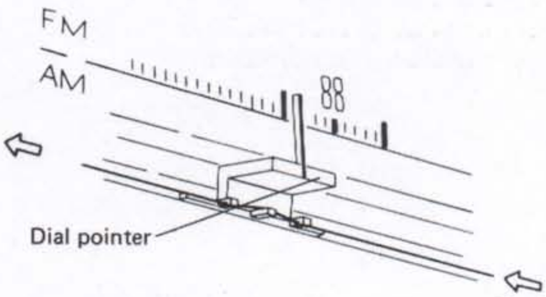


Fig. 9-3

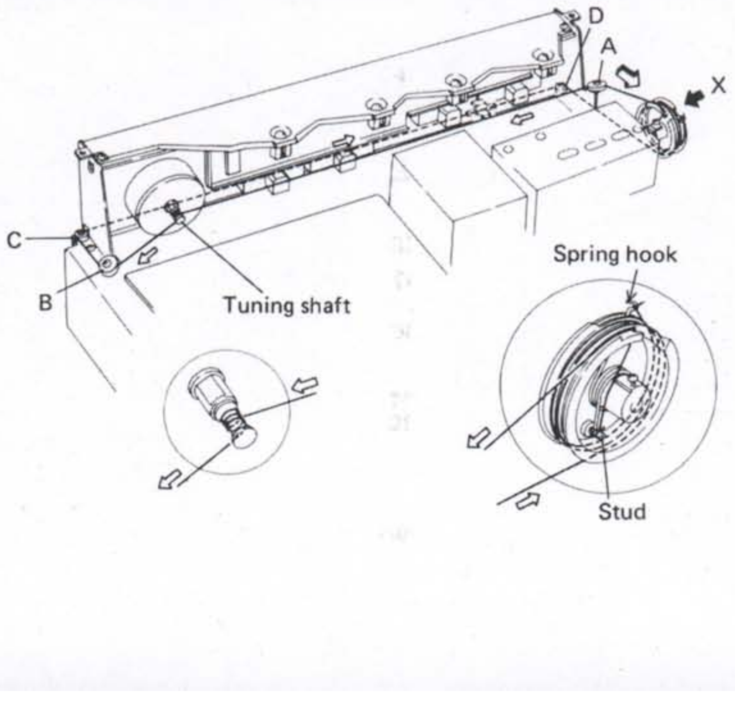


Fig. 9-4

10. ADJUSTMENTS

10.1 POWER AMPLIFIER

Turn VR$_3$ (L) and VR$_4$ (R) fully around in the countor-clockwise direction, but set VR$_1$ (L) and VR$_2$ (R) to the center positions. Without any load or input signal, turn the POWER switch ON.

10.1.1 DC Balance

Adjust VR$_1$(L) and VR$_2$(R) so that the potential difference between terminals 17(L) and 32(R) and ground reads zero volts (to within ±3 mV). If this level cannot be attained, disconnect the jumper leads B(L) and D(R) (or reconnect if already disconnected), and then readjust.

10.1.2 Idle Current

Adjust VR$_3$ (L) and VR$_4$ (R) so that the potential difference between the plus (+) terminals 24(L) and 25(R), and the minus (−) terminals 10(L) and 39(R) reads 30mV (or at least in the 20 to 40mV range). The potential difference between + terminals 23(L) and 26(R), and − terminals 11(L) and 38(R), and between + terminals 18(L) and 31(R), and − terminals 16(L) and 33(R) should also register about 30mV at this time. After passing a current for about 10 minutes, check these voltage readings again.

10.1.3 Output Power Meter Calibration

Apply a 1kHz signal to the POWER AMP IN terminals (or any other power amplifier input terminals). Adjust the level of this input signal so that the voltage on the output terminals (SPEAKERS) reads 46.48V (AC). Then-adjust VR$_2$ (L) and VR$_1$(R) of the meter amplifier assembly so that the output power meters read 270 watts.

Left Side View

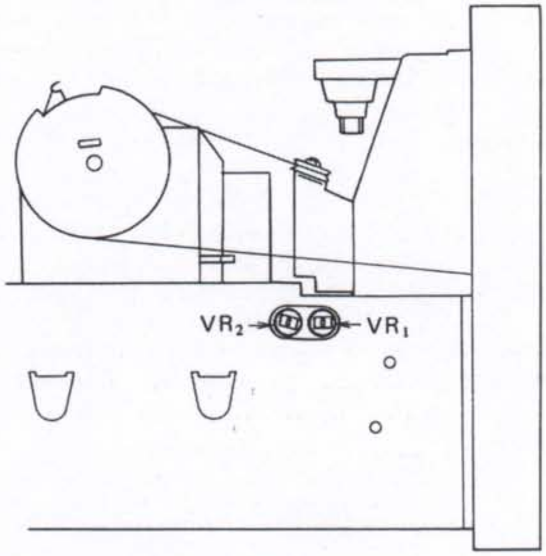


Fig. 10-2 Meter Calibration

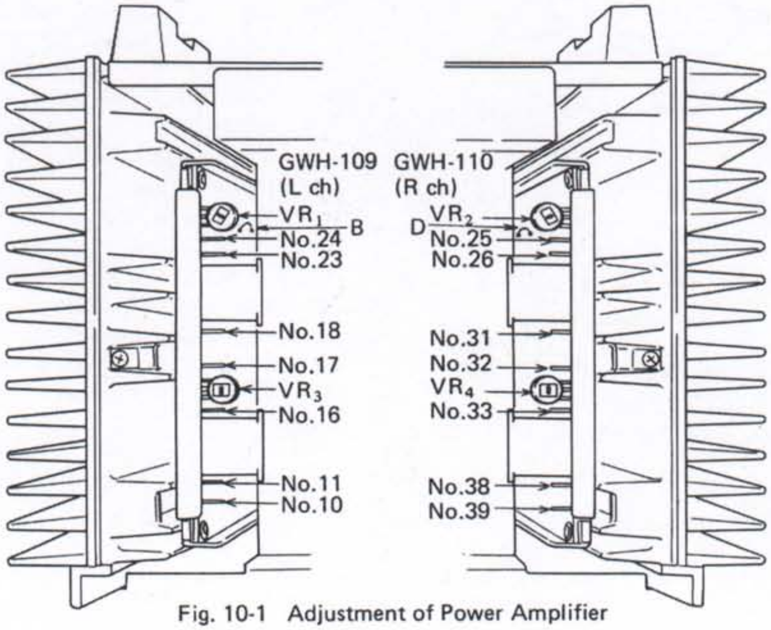


Fig. 10-1 Adjustment of Power Amplifier

10.2 FM TUNER

- Connect terminal 25 to terminal 12 of the tuner assembly via a resistor (of several kΩ to 100kΩ in value). (The hot side of the dial illumination lamp circuit acts as power supply — AC 7.5V). In this condition, the APC PLL circuit will be open, in which case the SX-1980 will operate much the same as a regular receiver.
- It is safer not to perform steps 13 through 18 since there is a danger that the necessary range characteristics will no longer be able to be obtained.
- Adjustments made on the FM front end may well result in the irrecoverable loss of performance. Defective front ends should be replaced altogether.

The tuning coil in the FM front end does not have an adjusting core. Consequently, tracking adjustments at 90 MHz are performed by regulating the gap between rotor and stator of the tuning capacitors (VC_0, VCA, VCR_1, VCR_2, VCR_3).

The expression "adjust VC (VC_0, VCA, VCR_1, VCR_2, VCR_3)" found in the text means that the two outer rotor blades of each of these tuning capacitors are to be extended outwards with spatula (Part No. GGK-066) as shown in Fig. 10-3.

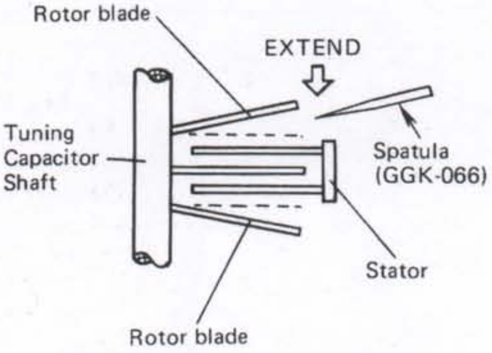


Fig. 10-3 Adjustment of Tuning Capacitor

1. Turn the FM function switch ON.
2. Turn the FM MUTING switch OFF.
3. Connect the FM signal generator (FM SG) to the 300-ohm FM ANTENNA terminals via a 300-ohm dummy load.
4. Connect an AC voltmeter and distortion meter to the L (or R) jacks of TAPE 1 REC.
5. Turn the dial indicator to 98MHz without any input signal.
6. Adjust the lower core of T_1 so that the TUNING meter reads dead center.
7. Adjust the FM SG output to 66dB, 400Hz ±75kHz deviation (100% modulation).
8. Set the tuning dial indicator and FM SG frequency to 90MHz.
9. Adjust the FM front end VC_0 so that the SIGNAL meter gives maximum deflection, and the TUNING meter reads dead center.
10. Reset the tuning dial indicator and FM SG frequency to 108MHz.
11. Adjust the FM front end TC_0 so that the SIGNAL meter gives maximum deflection, and the TUNING meter dead center.
12. Repeat steps 8 to 11 above until there is no further change in either meter.
13. Set the FM SG output to 20dB.
14. Set the tuning dial indicator and FM SG frequency to 90MHz.
15. Adjust FM front end VCA, VCR_1, VCR_2 and VCR_3 so that the SIGNAL meter gives maximum deflection.
16. Set the tuning dial indicator and FM SG frequency to 108MHz.
17. Adjust FM front end TCA, TCR_1, TCR_2 and TCR_3 so that the SIGNAL meter gives maximum deflection.
18. Repeat steps 14 to 17 above until there is no further change in either meter.
19. Set the FM SG frequency to 98MHz.
20. Adjust so that the SIGNAL meter gives maximum deflection, and the TUNING meter reads dead center.
21. Set the FM SG output to 66dB.
22. Adjust T_1 upper core to reduce distortion in the AF output (REC jack) to a minimum.
23. Turn the FM SG output right down to eliminate the input signal.
24. Adjust the T_1 lower core so that the TUNING meter reads dead center.
25. Repeat steps 21 to 24 above so that the TUNING meter reads dead center with a minimum of distortion.
26. Set the FM SG output to 106dB.
27. Check that the voltage on terminal 37 of the tuner assembly is 0V.

28. Adjust VR_1 so that the SIGNAL meter reads 4.8 (80% of the distance between 4 and 5 on the scale).
29. Turn the FM MUTING switch ON, and set the FMSG output to 26dB.
30. Adjust VR_2 to bring the input level to the starting point of the muting operation

Multiplex Decoder

31. Connect the multiplex signal generator (MPX SG) to the external modulator terminals of FM SG, thereby using FM SG as external modulation.
32. Connect the MPX SG pilot output terminal (19kHz) to the horizontal input terminal of an oscilloscope.

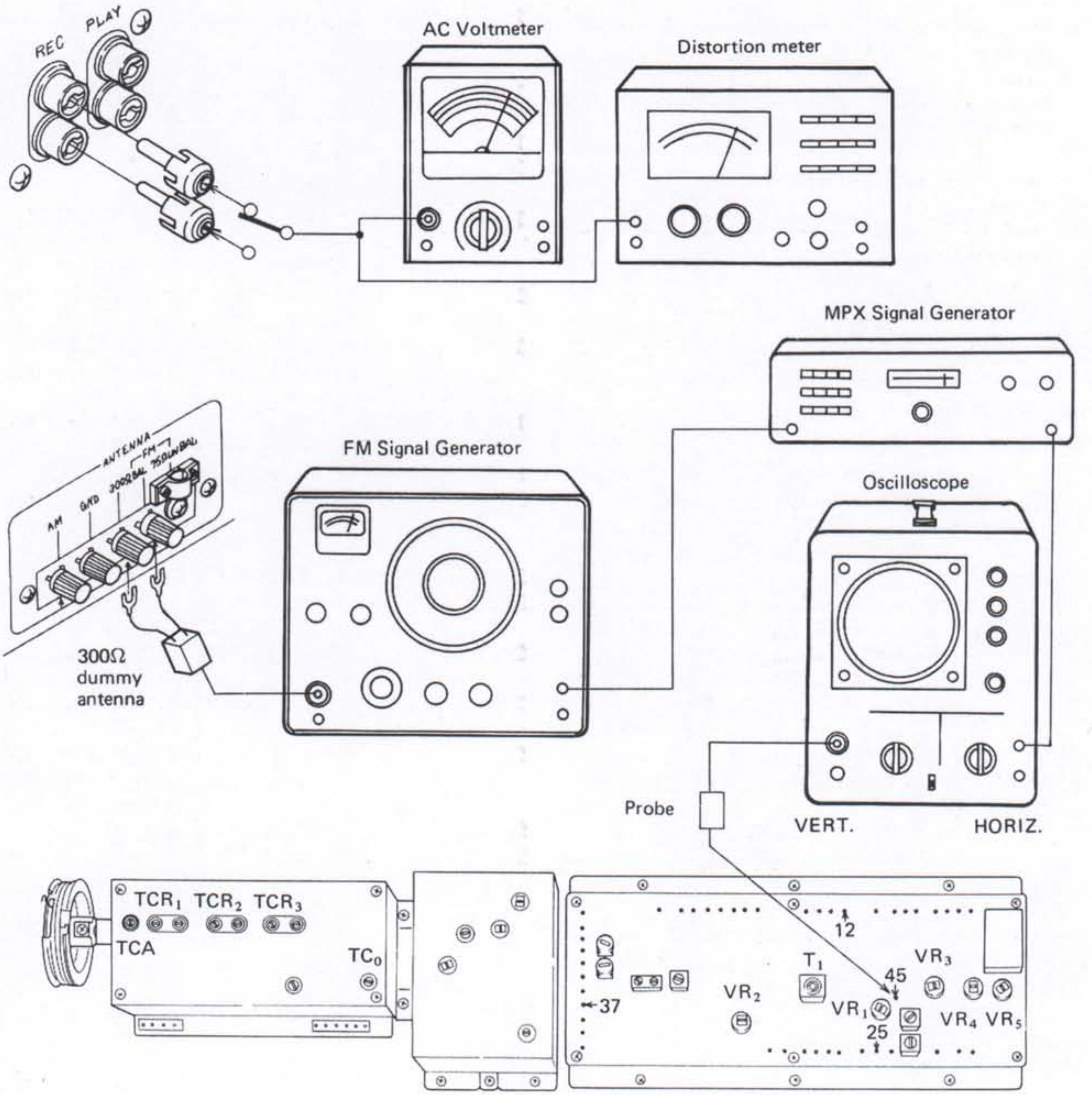

REC
PLAY
AC Voltmeter
Distortion meter
MPX Signal Generator
ANTENNA
FM
AM
GND
300Ω BAL
75Ω UNBAL
FM Signal Generator
Oscilloscope
300Ω dummy antenna
Probe
VERT.
HORIZ.
TCR₁ TCR₂ TCR₃
TCA
TC₀
12
T₁
VR₃
45
37
VR₂
VR₁
VR₄ VR₅
25

Fig. 10-4 Connection Diagram

33. Then connect terminal 45 of the tuner assembly to the vertical input terminal of the oscilloscope with a probe (10:1).
34. Set the FM SG output to 98MHz, 66dB, unmodulated.
35. Tune the receiver to check that the SIGNAL meter gives maximum deflection, and the TUNING meter reads dead center.
36. Adjust VR_3 so that a stationary Lissajous' figure (see Fig. 10-5) appears on the oscilloscope screen.
37. Set the MPX SG to pilot signal only (19kHz, ±7.5kHz deviation).
38. Adjust VR_4 so that the AC voltmeter (REC terminal) shows minimum reading (19kHz leak).
39. Set the MPX SG to 1kHz (L or R) ±67.5kHz deviation, and 19kHz (pilot signal) ±7.5kHz deviation.
40. Adjust VR_5 to reduce crosstalk between L and R to a minimum.

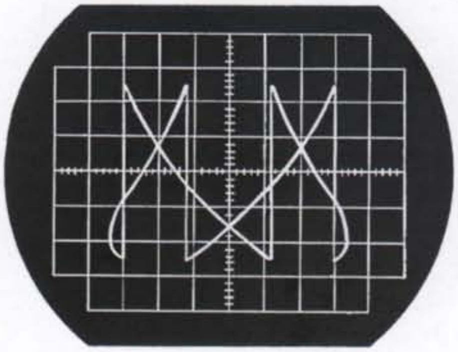


Fig. 10-5 Lissajous' Figure

10.3 APC ADJUSTMENTS

1. Connect an oscilloscope to terminal 12 of the APC assembly, and check the presence of a 100kHz square wave signal at the output.
2. Tune to a frequency close to (but not at) 90MHz.
3. Adjust VR_3 to obtain a voltage of DC 6.0V (±0.05V) across terminals 11 and 9 (+B, 13.5V) of the APC assembly.
4. Connect the oscilloscope across terminals 8 and 7 (ground) of the APC assembly, and then adjust L_2 to obtain the waveform of maximum size.
5. Next tune to a frequency near (but not exactly at) 98MHz.
6. Adjust VR_1 to obtain a reading of AC 450mV rms between terminals 8 and 7 (ground) of the APC assembly.
7. Then adjust VR_2 to obtain a reading of 0V (±0.01V) between terminals 8 and 13 of the APC assembly.

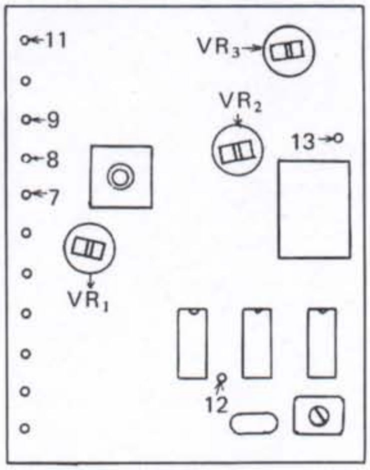
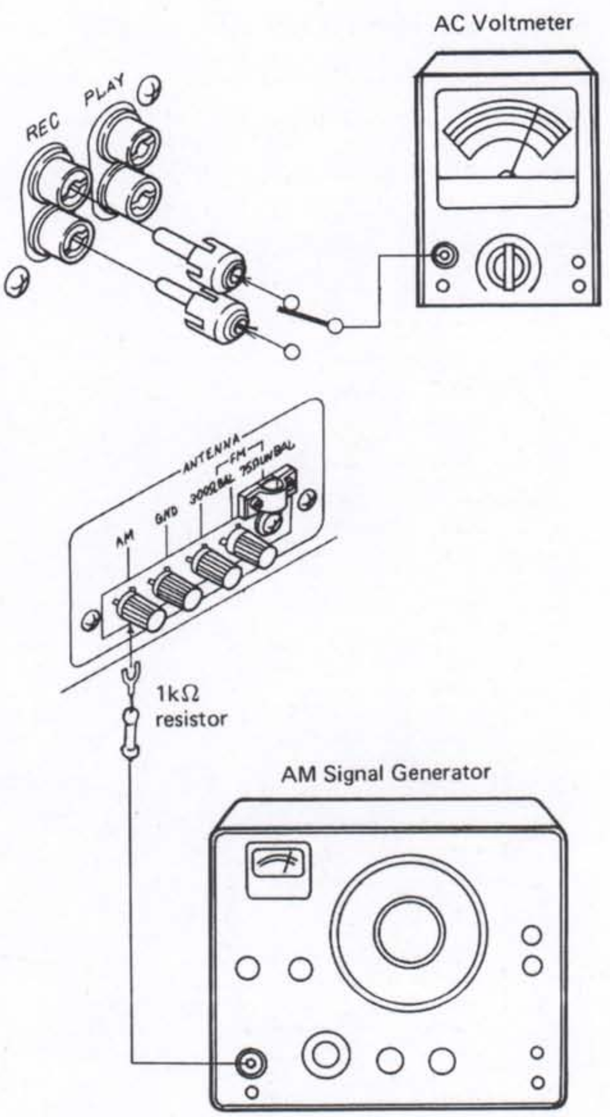


Fig. 10-6 APC Adjustment

10.4 AM TUNER

1. Connect the AM signal generator (AMSG) to the AM ANTENNA terminal via a 1kΩ resistor.
2. Turn the AM function switch ON.
3. Turn the DUPLICATE switch OFF, and connect an AC voltmeter to either the L or R TAPE 1 REC jack.
4. Apply a 400Hz, 30% modulated signal to AMSG, and set the output to 100dB.
5. Adjust the tuning dial indicator and AMSG frequency to 600kHz.
6. Adjust the T_2 core to provide maximum reading in the AC voltmeter.
7. Next readjust the tuning dial indicator and AMSG frequency to 1400kHz.
8. Adjust AM_3 (trimmer) to again provide maximum reading in the AC voltmeter.
9. Set AMSG to 30dB output level.
10. Return the tuning dial indicator and AMSG frequency to 600kHz.
11. This time adjust T_2, T_3, and the bar antenna core to provide maximum reading in the AC voltmeter.
12. Return the tuning dial indicator and AMSG frequency back to 1400kHz.
13. Adjust AM_3, AM_2 and AM_1 (trimmers) to again provide maximum reading in the AC voltmeter.
14. Repeat steps 10 to 13 above until no further changes occur in the AC voltage readings at the 600kHz and 1400kHz positions.



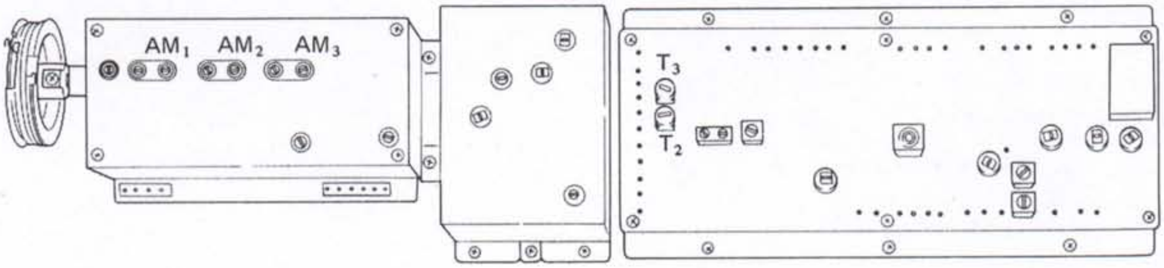
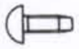
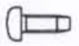
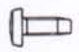
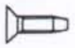
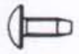
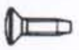
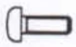
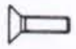
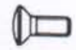
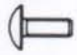
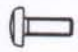
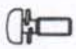
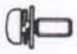
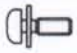


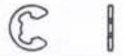
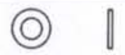
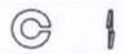
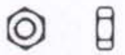
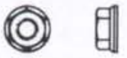
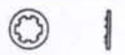
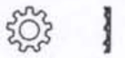
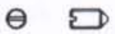
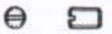
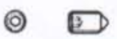
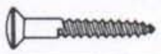
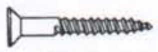
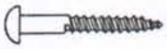
Fig. 10-7

11. EXPLODED VIEW

NOMENCLATURE OF SCREWS, WASHERS AND NUTS

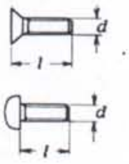
The following symbols stand for screws, washers and nuts as shown in exploded view.

Symbol	Description	Shape
RT	Brazier head tapping screw	
PT	Pan head tapping screw	
BT	Binding head tapping screw	
CT	Countersunk head tapping screw	
TT	Truss head tapping screw	
OCT	Oval countersunk head tapping screw	
PM	Pan head machine screw	
CM	Countersunk head machine screw	
OCM	Oval countersunk head machine screw	
TM	Truss head machine screw	
BM	Binding head machine screw	
PSA	Pan head screw with spring lock washer	
PSB	Pan head screw with spring lock washer and flat washer	
PSF	Pan head screw with flat washer	

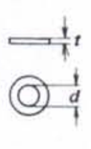
Symbol	Description	Shape
EW	E type washer	
FW	Flat washer	
SW	Spring lock washer	
N	Nut	
WN	Washer faced nut	
ITW	Internal toothed lock washer	
OTW	Outernal toothed lock washer	
SC	Slotted set screw (Cone point)	
SF	Slotted set screw (Flat point)	
HS	Hexagon socket headless set screw	
OCW	Oval countersunk head wood screw	
CW	Countersunk head wood screw	
RW	Round head wood screw	

EXAMPLE

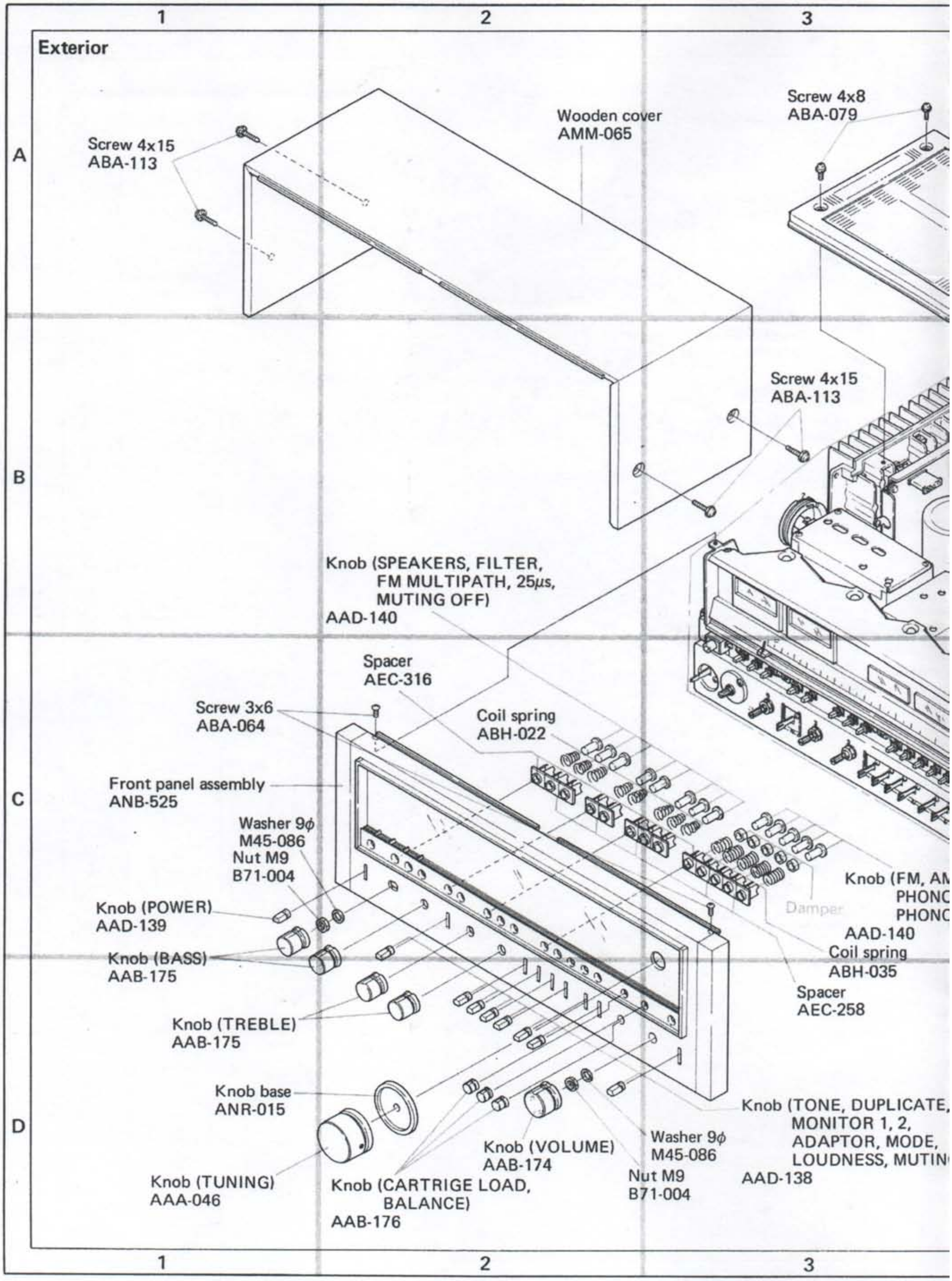
PM 3x8
length in mm (l)
diameter in mm (d)
Symbol



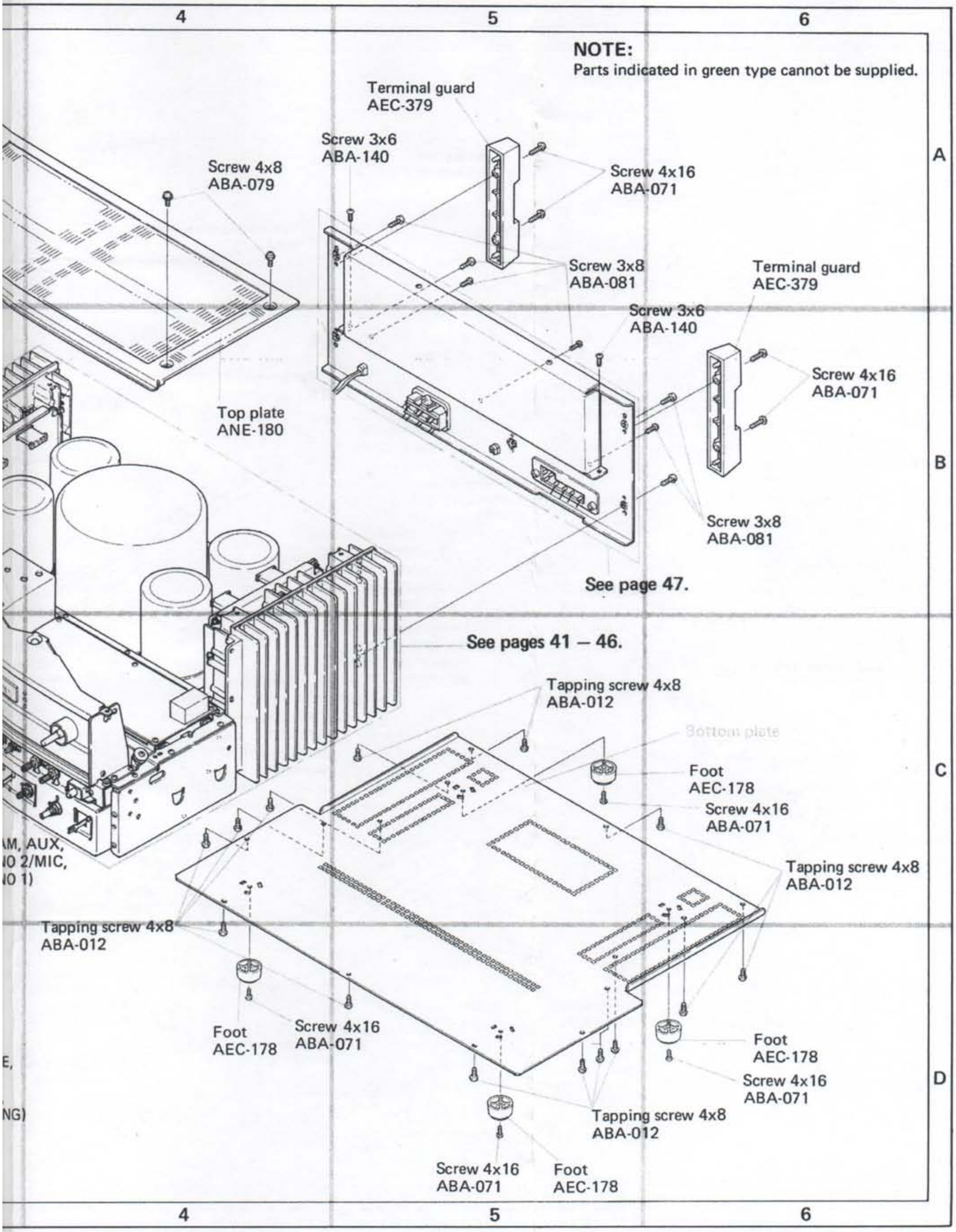
FW $9\phi\times1^{t}$
thickness in mm (t)
diameter in mm (d)
Symbol

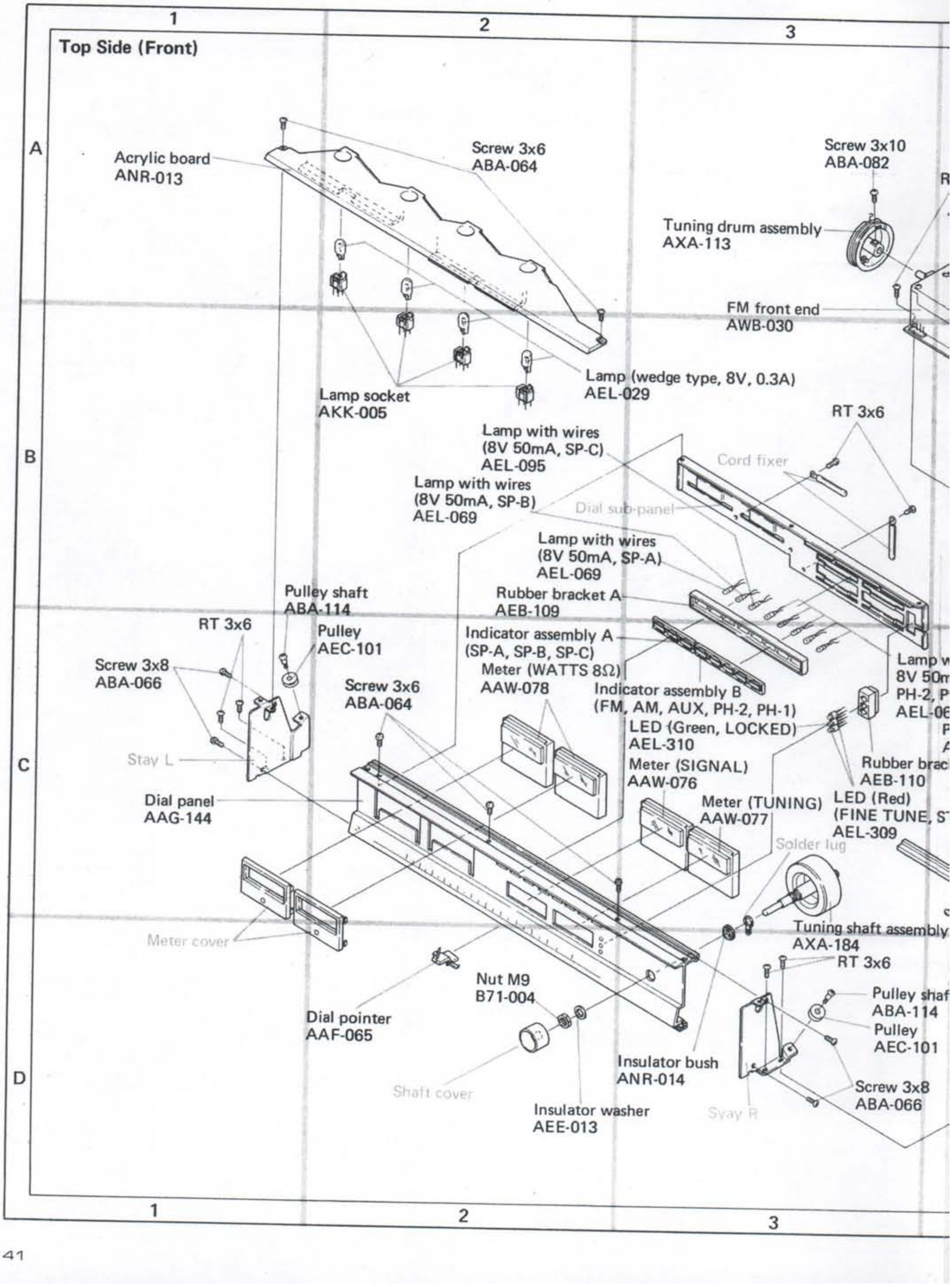


Exterior

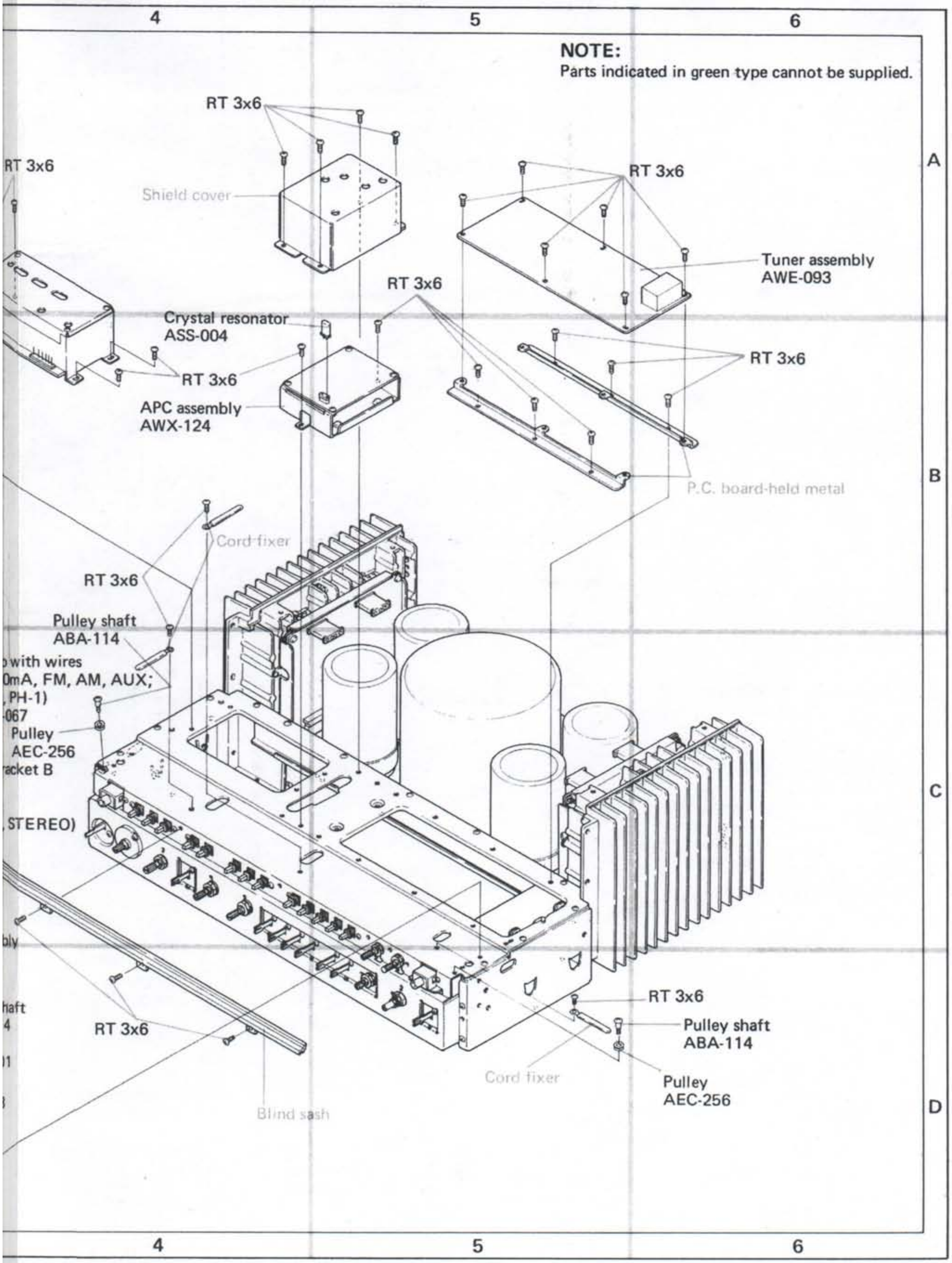

1
2
3
A
B
C
D
Wooden cover
AMM-065
Screw 4x15
ABA-113
Screw 4x8
ABA-079
Screw 4x15
ABA-113
Knob (SPEAKERS, FILTER,
FM MULTIPATH, 25μs,
MUTING OFF)
AAD-140
Spacer
AEC-316
Screw 3x6
ABA-064
Coil spring
ABH-022
Front panel assembly
ANB-525
Washer 9ϕ
M45-086
Nut M9
B71-004
Knob (POWER)
AAD-139
Knob (BASS)
AAB-175
Knob (TREBLE)
AAB-175
Damper
Knob (FM, A
PHON
PHON
AAD-140
Coil spring
ABH-035
Spacer
AEC-258
Knob base
ANR-015
Knob (TUNING)
AAA-046
Knob (CARTRIGE LOAD,
BALANCE)
AAB-176
Knob (VOLUME)
AAB-174
Washer 9ϕ
M45-086
Nut M9
B71-004
Knob (TONE, DUPLICATE,
MONITOR 1, 2,
ADAPTOR, MODE,
LOUDNESS, MUTIN
AAD-138
1
2
3

NOTE:
Parts indicated in green type cannot be supplied.


4
5
6
A
B
C
D
Terminal guard
AEC-379
Screw 3x6
ABA-140
Screw 4x8
ABA-079
Screw 4x16
ABA-071
Screw 3x8
ABA-081
Terminal guard
AEC-379
Screw 3x6
ABA-140
Screw 4x16
ABA-071
Top plate
ANE-180
Screw 3x8
ABA-081
See page 47.
See pages 41 – 46.
Tapping screw 4x8
ABA-012
Bottom plate
Foot
AEC-178
Screw 4x16
ABA-071
Tapping screw 4x8
ABA-012
M, AUX,
O 2/MIC,
O 1)
Tapping screw 4x8
ABA-012
Foot
AEC-178
Screw 4x16
ABA-071
Foot
AEC-178
Screw 4x16
ABA-071
E,
NG)
Tapping screw 4x8
ABA-012
Screw 4x16
ABA-071
Foot
AEC-178
4
5
6

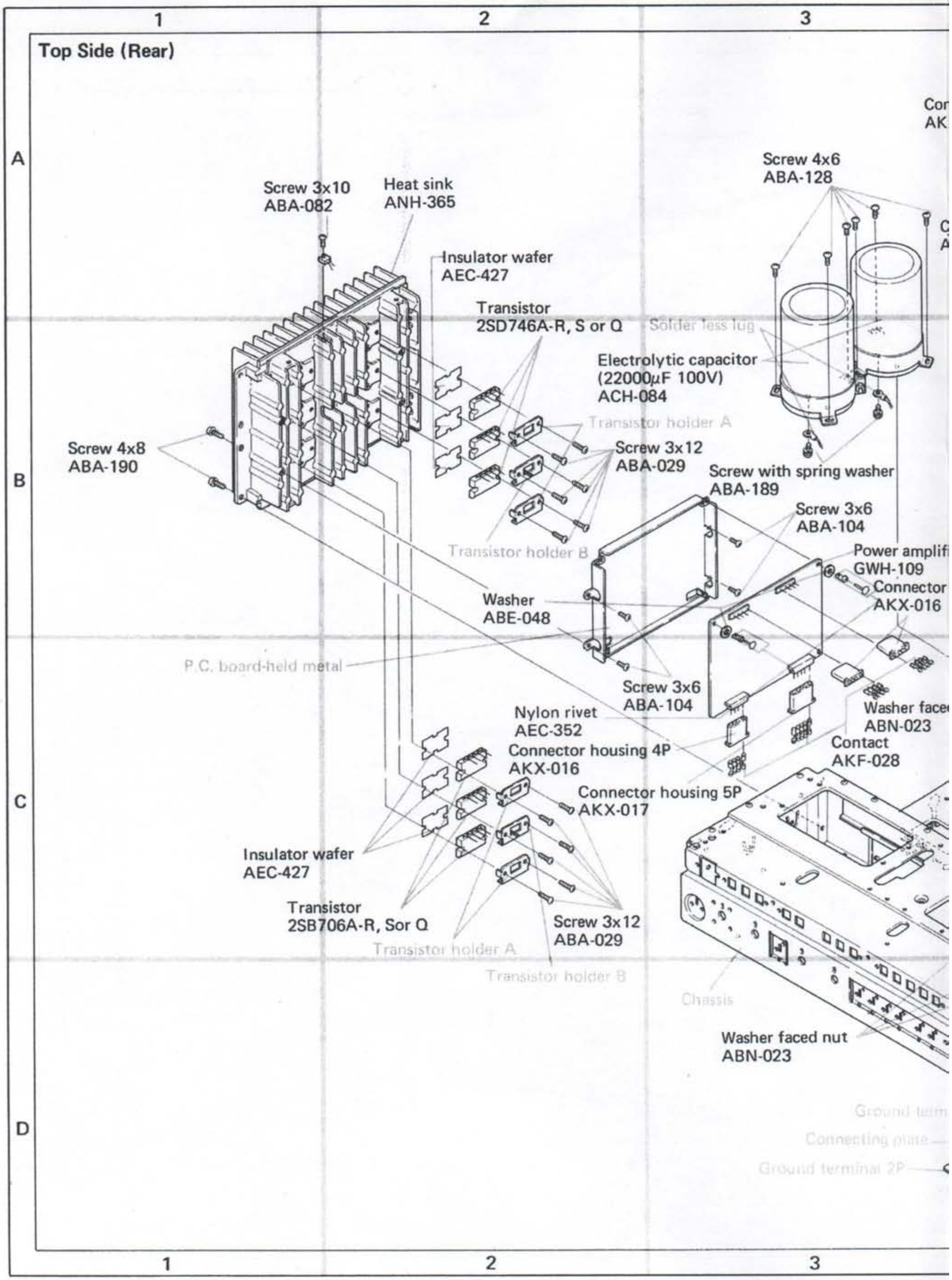

1
2
3
A
B
C
D
Top Side (Front)
Acrylic board
ANR-013
Screw 3x6
ABA-064
Screw 3x10
ABA-082
R
Tuning drum assembly
AXA-113
FM front end
AWB-030
Lamp (wedge type, 8V, 0.3A)
AEL-029
Lamp socket
AKK-005
RT 3x6
Lamp with wires
(8V 50mA, SP-C)
AEL-095
Cord fixer
Lamp with wires
(8V 50mA, SP-B)
AEL-069
Dial sub-panel
Lamp with wires
(8V 50mA, SP-A)
AEL-069
Rubber bracket A
AEB-109
Pulley shaft
ABA-114
RT 3x6
Pulley
AEC-101
Indicator assembly A
(SP-A, SP-B, SP-C)
Lamp w
8V 50m
PH-2, P
AEL-06
Screw 3x8
ABA-066
Meter (WATTS 8Ω)
AAW-078
Screw 3x6
ABA-064
Indicator assembly B
(FM, AM, AUX, PH-2, PH-1)
LED (Green, LOCKED)
AEL-310
P
A
Stay L
Meter (SIGNAL)
AAW-076
Rubber brac
AEB-110
Dial panel
AAG-144
Meter (TUNING)
AAW-077
LED (Red)
(FINE TUNE, S
AEL-309
Solder lug
Meter cover
Tuning shaft assembly
AXA-184
RT 3x6
Nut M9
B71-004
Pulley shaf
ABA-114
Dial pointer
AAF-065
Pulley
AEC-101
Insulator bush
ANR-014
Shaft cover
Screw 3x8
ABA-066
Insulator washer
AEE-013
Syay R
1
2
3

NOTE:
Parts indicated in green type cannot be supplied.



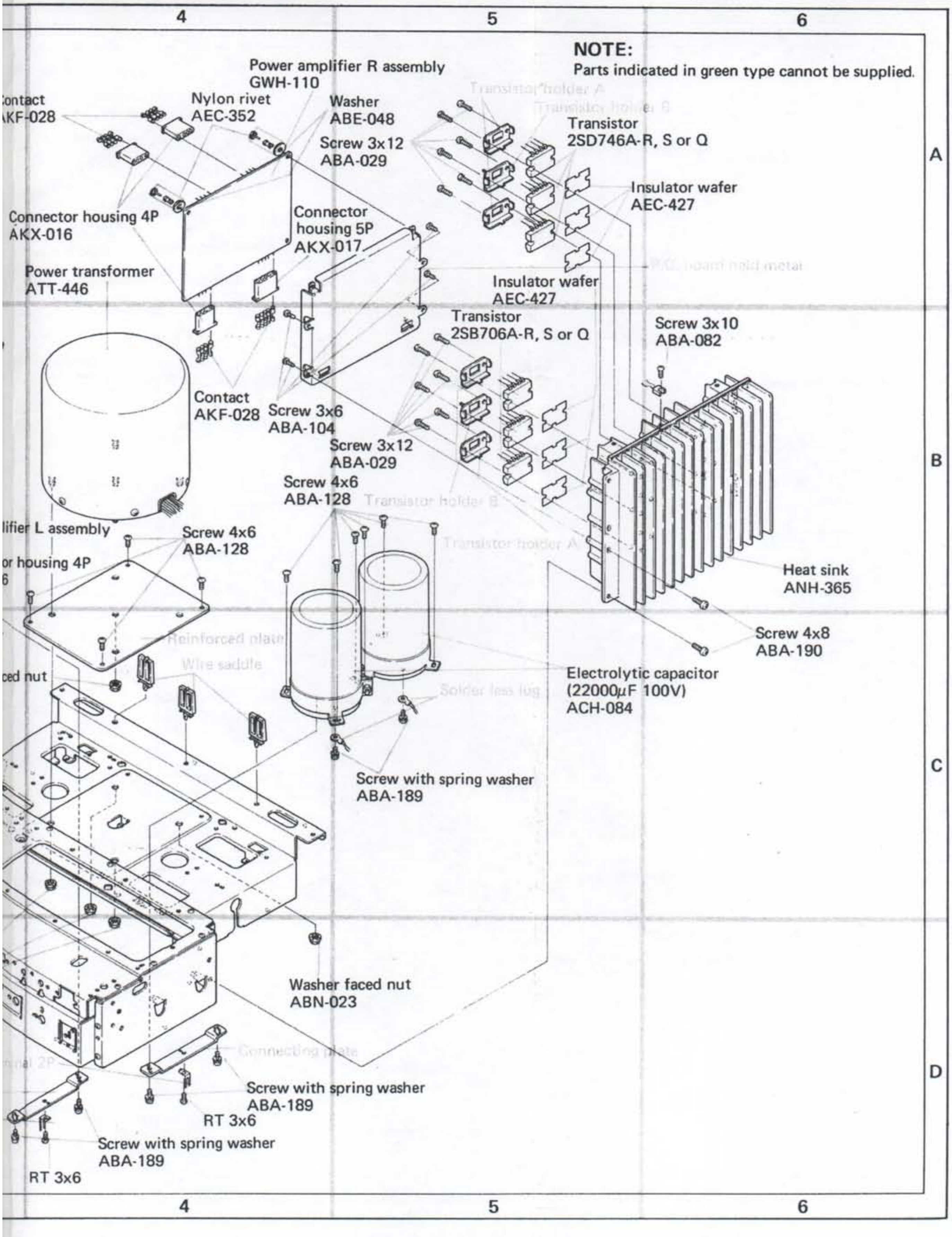
4
5
6
A
B
C
D
RT 3x6
RT 3x6
Shield cover
RT 3x6
Tuner assembly
AWE-093
RT 3x6
Crystal resonator
ASS-004
RT 3x6
RT 3x6
APC assembly
AWX-124
P.C. board-held metal
Cord fixer
RT 3x6
Pulley shaft
ABA-114
with wires
0mA, FM, AM, AUX;
, PH-1)
-067
Pulley
AEC-256
racket B
, STEREO)
bly
haft
4
1
RT 3x6
RT 3x6
Pulley shaft
ABA-114
Cord fixer
Pulley
AEC-256
Blind sash
4
5
6

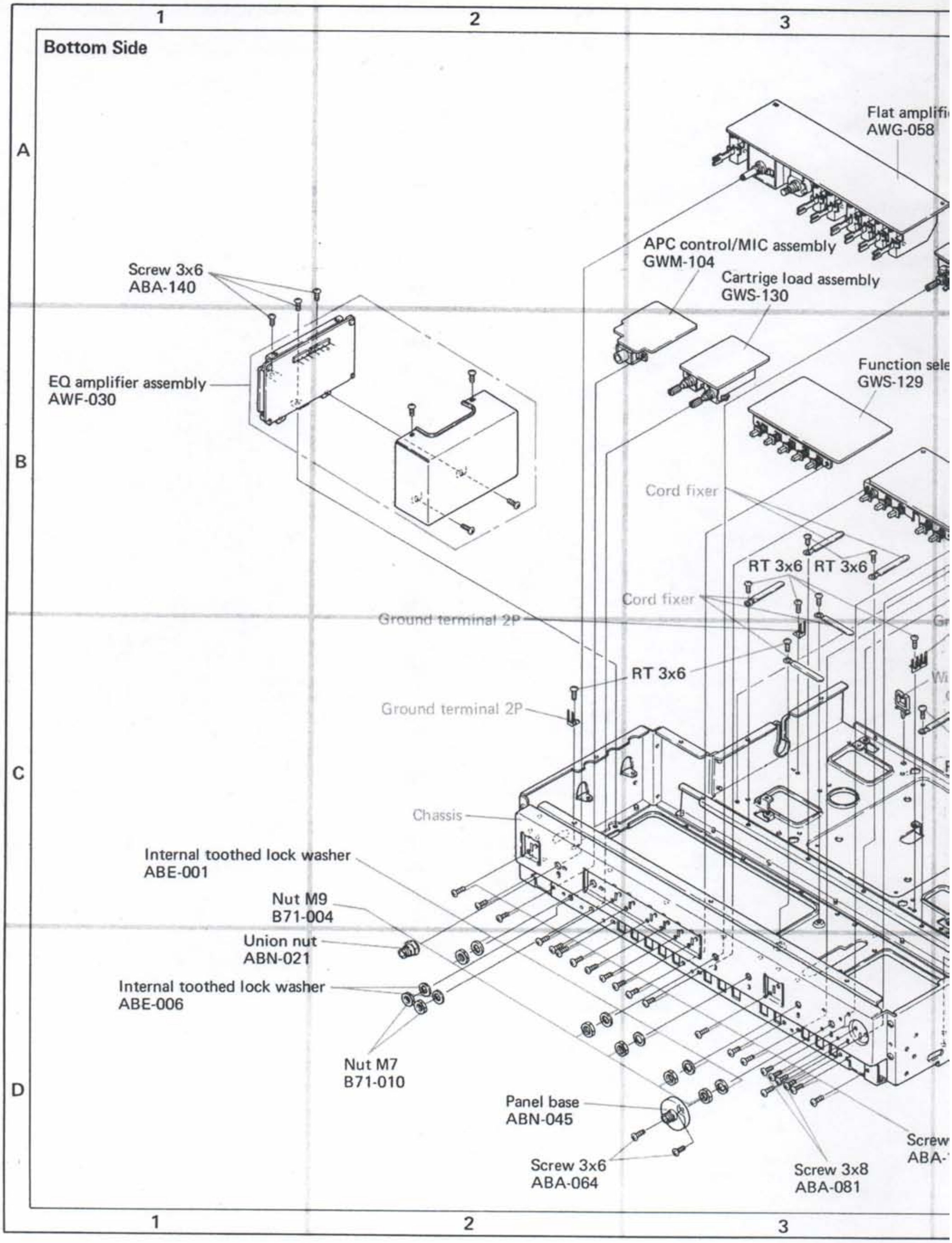
Top Side (Rear)



1
2
3
A
B
C
D
Cor
AK
Screw 4x6
ABA-128
C
A
Screw 3x10
ABA-082
Heat sink
ANH-365
Insulator wafer
AEC-427
Transistor
2SD746A-R, S or Q
Solder less lug
Electrolytic capacitor
(22000μF 100V)
ACH-084
Transistor holder A
Screw 4x8
ABA-190
Screw 3x12
ABA-029
Screw with spring washer
ABA-189
Screw 3x6
ABA-104
Transistor holder B
Power amplifi
GWH-109
Connector
AKX-016
Washer
ABE-048
P.C. board-held metal
Screw 3x6
ABA-104
Washer face
ABN-023
Nylon rivet
AEC-352
Contact
AKF-028
Connector housing 4P
AKX-016
Connector housing 5P
AKX-017
Insulator wafer
AEC-427
Transistor
2SB706A-R, Sor Q
Screw 3x12
ABA-029
Transistor holder A
Transistor holder B
Chassis
Washer faced nut
ABN-023
Ground term
Connecting plate
Ground terminal 2P
1
2
3

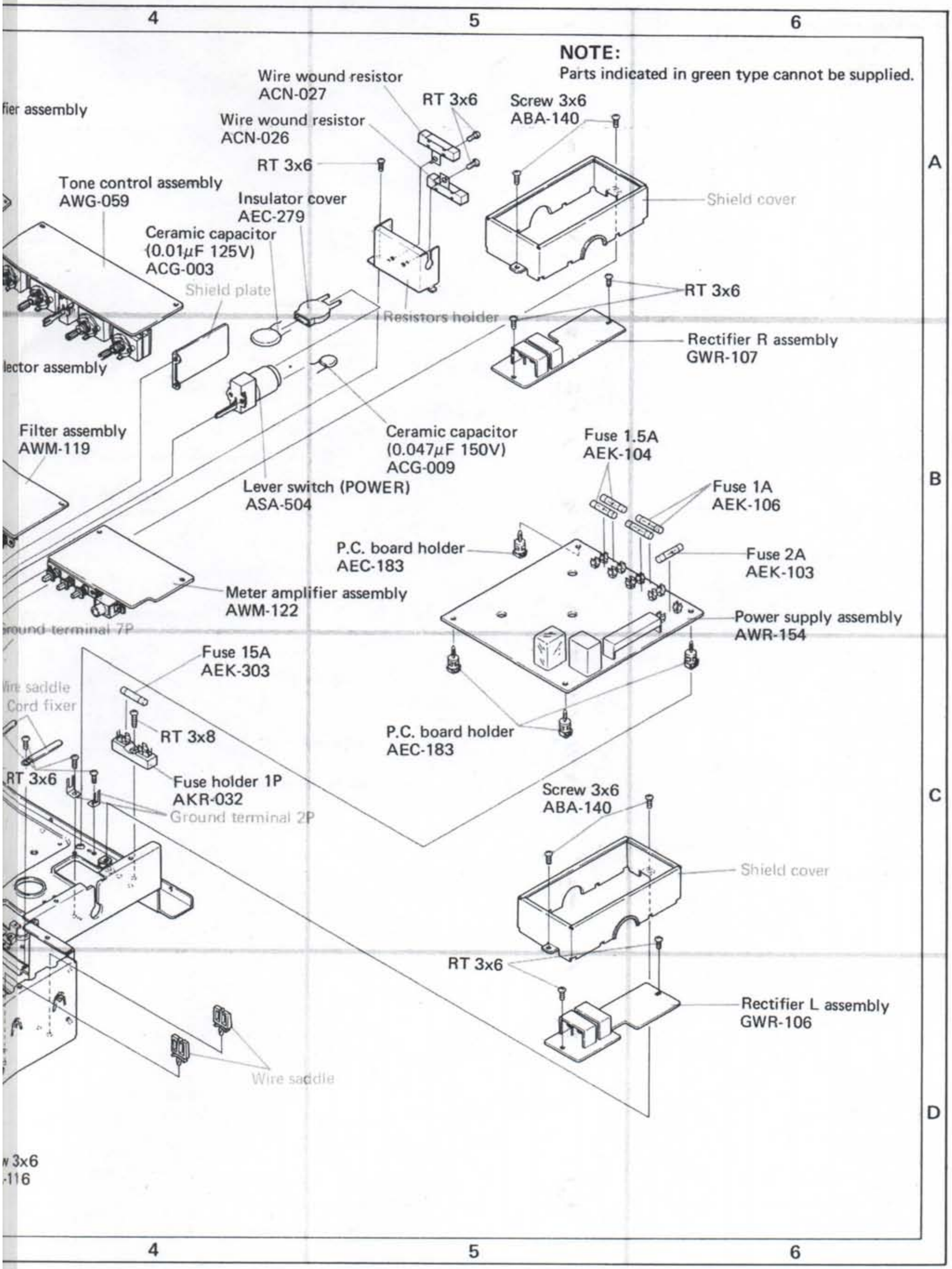
NOTE:
Parts indicated in green type cannot be supplied.


4
5
6
A
B
C
D
ontact
KF-028
Power amplifier R assembly
GWH-110
Nylon rivet
AEC-352
Washer
ABE-048
Screw 3x12
ABA-029
Transistor holder A
Transistor holder B
Transistor
2SD746A-R, S or Q
Insulator wafer
AEC-427
Connector housing 4P
AKX-016
Connector
housing 5P
AKX-017
P.C. board hold metal
Power transformer
ATT-446
Insulator wafer
AEC-427
Transistor
2SB706A-R, S or Q
Screw 3x10
ABA-082
Contact
AKF-028
Screw 3x6
ABA-104
Screw 3x12
ABA-029
Screw 4x6
ABA-128
Transistor holder B
Transistor holder A
lifier L assembly
Screw 4x6
ABA-128
or housing 4P
6
Heat sink
ANH-365
Screw 4x8
ABA-190
Reinforced plate
Wire saddle
ced nut
Electrolytic capacitor
(22000μF 100V)
ACH-084
Solder less lug
Screw with spring washer
ABA-189
Washer faced nut
ABN-023
Connecting plate
inal 2P
Screw with spring washer
ABA-189
RT 3x6
Screw with spring washer
ABA-189
RT 3x6
4
5
6


1
2
3
Bottom Side
A
B
C
D
Flat amplifi
AWG-058
APC control/MIC assembly
GWM-104
Cartrige load assembly
GWS-130
Screw 3x6
ABA-140
Function sele
GWS-129
EQ amplifier assembly
AWF-030
Cord fixer
RT 3x6
RT 3x6
Cord fixer
Ground terminal 2P
Gr
RT 3x6
Wi
Ground terminal 2P
Chassis
Internal toothed lock washer
ABE-001
Nut M9
B71-004
Union nut
ABN-021
Internal toothed lock washer
ABE-006
Nut M7
B71-010
Panel base
ABN-045
Screw 3x6
ABA-064
Screw 3x8
ABA-081
Screw
ABA-
1
2
3

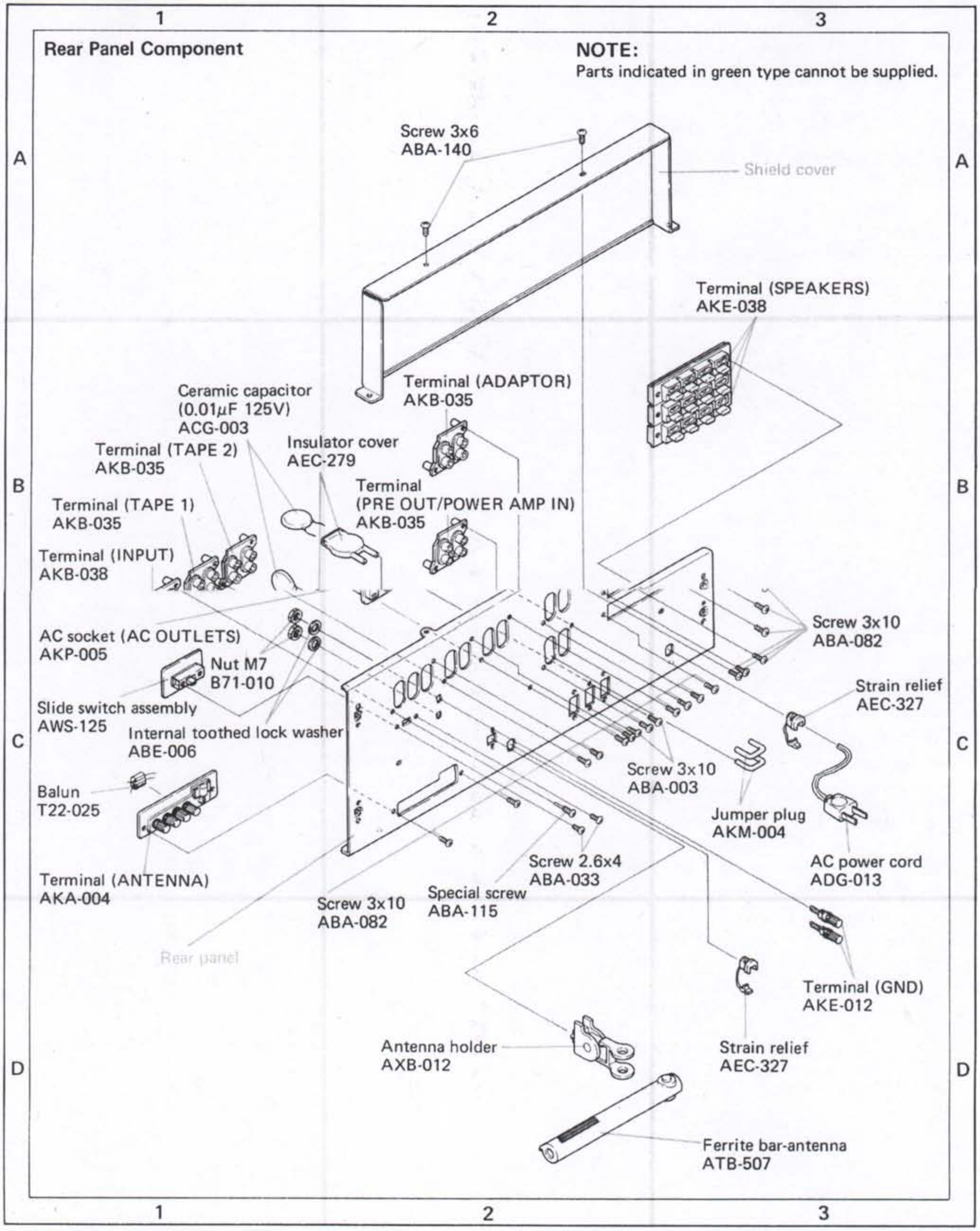
NOTE:

Parts indicated in green type cannot be supplied.


4
5
6
A
B
C
D
fier assembly
Wire wound resistor
ACN-027
RT 3x6
Screw 3x6
ABA-140
Wire wound resistor
ACN-026
RT 3x6
Tone control assembly
AWG-059
Insulator cover
AEC-279
Shield cover
Ceramic capacitor
(0.01µF 125V)
ACG-003
Shield plate
RT 3x6
Resistors holder
Rectifier R assembly
GWR-107
lector assembly
Filter assembly
AWM-119
Ceramic capacitor
(0.047µF 150V)
ACG-009
Fuse 1.5A
AEK-104
Lever switch (POWER)
ASA-504
Fuse 1A
AEK-106
P.C. board holder
AEC-183
Fuse 2A
AEK-103
Meter amplifier assembly
AWM-122
Power supply assembly
AWR-154
round terminal 7P
Fuse 15A
AEK-303
ire saddle
Cord fixer
RT 3x8
P.C. board holder
AEC-183
RT 3x6
Fuse holder 1P
AKR-032
Ground terminal 2P
Screw 3x6
ABA-140
Shield cover
RT 3x6
Rectifier L assembly
GWR-106
Wire saddle
v 3x6
-116

Rear Panel Component

NOTE:
Parts indicated in green type cannot be supplied.

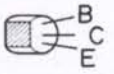

1
2
3
A
B
C
D
Screw 3x6
ABA-140
Shield cover
Terminal (SPEAKERS)
AKE-038
Ceramic capacitor
(0.01μF 125V)
ACG-003
Terminal (ADAPTOR)
AKB-035
Terminal (TAPE 2)
AKB-035
Insulator cover
AEC-279
Terminal
(PRE OUT/POWER AMP IN)
AKB-035
Terminal (TAPE 1)
AKB-035
Terminal (INPUT)
AKB-038
AC socket (AC OUTLETS)
AKP-005
Nut M7
B71-010
Screw 3x10
ABA-082
Strain relief
AEC-327
Slide switch assembly
AWS-125
Internal toothed lock washer
ABE-006
Screw 3x10
ABA-003
Balun
T22-025
Jumper plug
AKM-004
AC power cord
ADG-013
Screw 2.6x4
ABA-033
Terminal (ANTENNA)
AKA-004
Special screw
ABA-115
Screw 3x10
ABA-082
Rear panel
Terminal (GND)
AKE-012
Antenna holder
AXB-012
Strain relief
AEC-327
Ferrite bar-antenna
ATB-507
1
2
3

12. SCHEMATIC DIAGRAMS, P.C. BOARD PATTERNS AND PARTS LIST

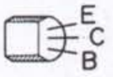
12.1 MISCELLANEA

External Appearance of Transistors and ICs

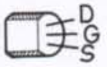
2SC945A
2SA872A
2SC1775A
2SA733
2SC1438
2SC1318
2SA720



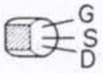
2SC763
2SC1312
2SC1313
2SA628A
2SC710
2SC869
2SC1919
2SA726S



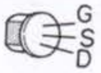
2SK34



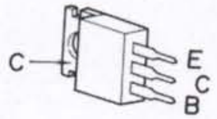
2SK61



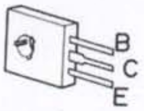
2SK19



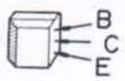
2SC2238C
2SB536
2SD325R
2SA968C



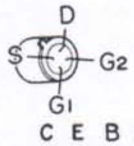
2SC1904A
2SA899A



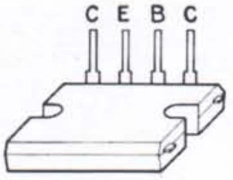
2SC461



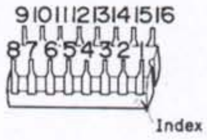
3SK45



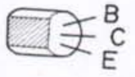
2SD746A
2SB706A



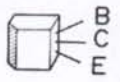
HA1197
PA3001-A
PA1001-A
PA1002-A


9 10 11 12 13 14 15 16
8 7 6 5 4 3 2 1
Index

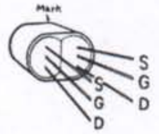
2SC1885
2SA912



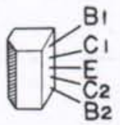
2SC1344



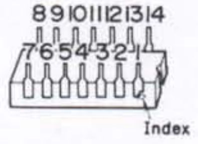
2SK131


Mark
S
G
D
S
G
D

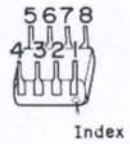
2SA798
2SA979



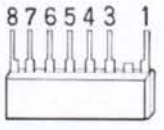
M5S003P
M53293P
M53273P


8 9 10 11 12 13 14
7 6 5 4 3 2 1
Index

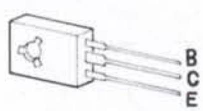
HA1201


5 6 7 8
4 3 2 1
Index

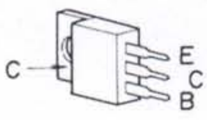
PA3004



2SC2071
2SA939



2SD712
2SB682



Miscellaneaus Parts

NOTE:
- *Capacitors: in μF unless otherwise noted p:pF*
- *Resistors: in Ω, ¼W unless otherwise noted k:kΩ, M:MΩ*

CAPACITORS

Symbol	Part No.	Description		
C1	ACH-084	Electrolytic	22000	100V
C2	ACH-084	Electrolytic	22000	100V
C3	ACH-084	Electrolytic	22000	100V
C4	ACH-084	Electrolytic	22000	100V
C5	ACG-003	Ceramic	0.01	125V
C6	ACG-003	Ceramic	0.01	125V
C7	CKDYF 403Z 50	Ceramic	0.04	50V
C8	CKDYF 403Z 50	Ceramic	0.04	50V
C9	CKDYF 403Z 50	Ceramic	0.04	50V
C10	CKDYF 403Z 50	Ceramic	0.04	50V
C11	CKDYF 403Z 50	Ceramic	0.04	50V
C12	CKDYF 403Z 50	Ceramic	0.04	50V
C13	ACG-009	Ceramic	0.047	150V
C14	ACG-009	Ceramic	0.047	150V
C15	ACG-009	Ceramic	0.047	150V
C16	ACG-009	Ceramic	0.047	150V
C17	ACG-003	Ceramic	0.01	125V
C18	ACG-009	Ceramic	0.047	150V

RESISTORS

Symbol	Part No.	Description		
R1	RD½PS 225J	Carbon film	2.2M	½W
R2	ACN-026	Wire wound	360	10W
R3	ACN-027	Wire wound	470	10W

OTHERS

Symbol	Part No.	Description
X1	ASS-004	Crystal resonator
T1	T22-025	Balun
T2	ATB-507	Ferrite bar-antenna
T3	ATT-446	Power transformer
S26	ASA-504	Lever switch (POWER)
	ADG-013	AC power cord
	AKR-032	Fuse holder 1P
	AKK-005	Lamp socket
L1	T24-028	RF choke coil

SEMICONDUCTORS

Symbol	Part No.	Description
Q1	2SB706A-R,SorQ	Transistor
Q2	2SB706A-R,SorQ	Transistor
Q3	2SB706A-R,SorQ	Transistor
Q4	2SB706A-R,SorQ	Transistor
Q5	2SB706A-R,SorQ	Transistor
Q6	2SB706A-R,SorQ	Transistor
Q7	2SD746A-R,SorQ	Transistor
Q8	2SD746A-R,SorQ	Transistor
Q9	2SD746A-R,SorQ	Transistor
Q10	2SD746A-R,SorQ	Transistor
Q11	2SD746A-R,SorQ	Transistor
Q12	2SD746A-R,SorQ	Transistor
D1	AEL-309	LED (FINE TUNE)
D2	AEL-309	LED (STEREO)
D3	AEL-310	LED (QUARTZ LOCKED)

LAMPS

Symbol	Part No.	Description	
PL1	AEL-029	Lamp (wedge type) 8V	0.3A
PL2	AEL-029	Lamp (wedge type) 8V	0.3A
PL3	AEL-029	Lamp (wedge type) 8V	0.3A
PL4	AEL-029	Lamp (wedge type) 8V	0.3A
PL5	AEL-067	Lamp (wedge type) 8V	50mA
PL6	AEL-067	Lamp with wires 8V	50mA
PL7	AEL-067	Lamp with wires 8V	50mA
PL8	AEL-067	Lamp with wires 8V	50mA
PL9	AEL-067	Lamp with wires 8V	50mA
PL10	AEL-069	Lamp with wires 8V	50mA
PL11	AEL-069	Lamp with wires 8V	50mA
PL12	AEL-095	Lamp with wires 8V	50mA

FUSES

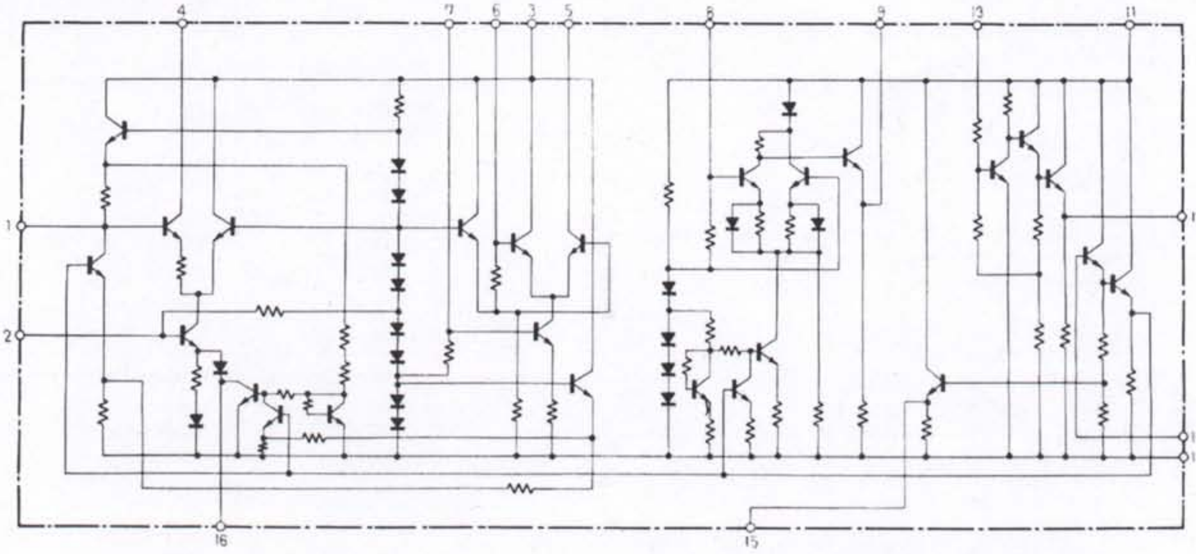
Symbol	Part No.	Description	
FU1	AEK-106	Fuse	1A
FU2	AEK-106	Fuse	1A
FU3	AEK-104	Fuse	1.5A
FU4	AEK-104	Fuse	1.5A
FU5	AEK-103	Fuse	2A
FU6	AEK-303	Fuse	15A

P.C. BOARD ASSEMBLIES

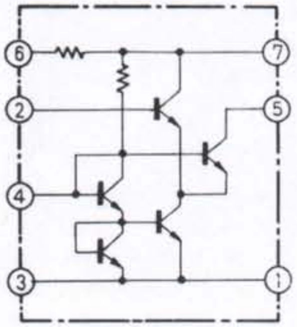
Symbol	Part No.	Description
	AWB-030	FM front end
	AWE-093	Tuner assembly
	AWX-124	APC assembly
	AWG-059	Tone control assembly
	AWG-058	Flat amplifier assembly
	AWF-030	EQ amplifier assembly
	AWM-119	Filter assembly
	AWR-154	Power supply assembly
	AWS-125	Slide switch assembly
	GWR-106	Rectifier L assembly
	GWR-107	Rectifier R assembly
	GWH-109	Power amplifier L assembly
	GWH-110	Power amplifier R assembly
	GWS-129	Function selector assembly
	GWS-130	Cartridge load assembly
	GWM-104	APC control/MIC assembly
	AWM-122	Meter amplifier assembly

Circuit Diagram of IC

HA1197 (AM IC)

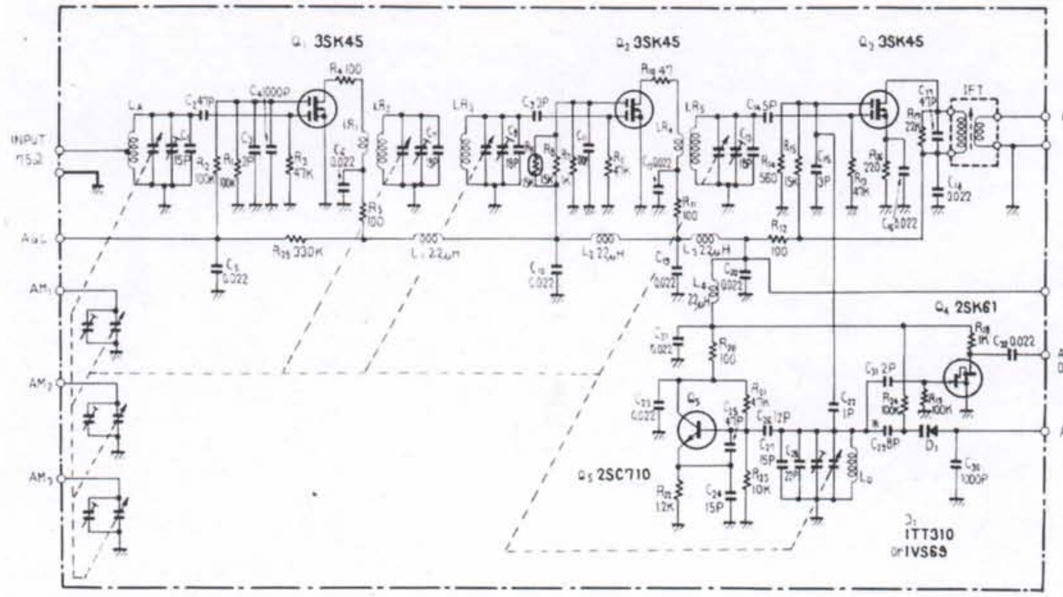

4
7
6
3
5
8
9
13
11
1
2
12
14
10
16
15

HA1201

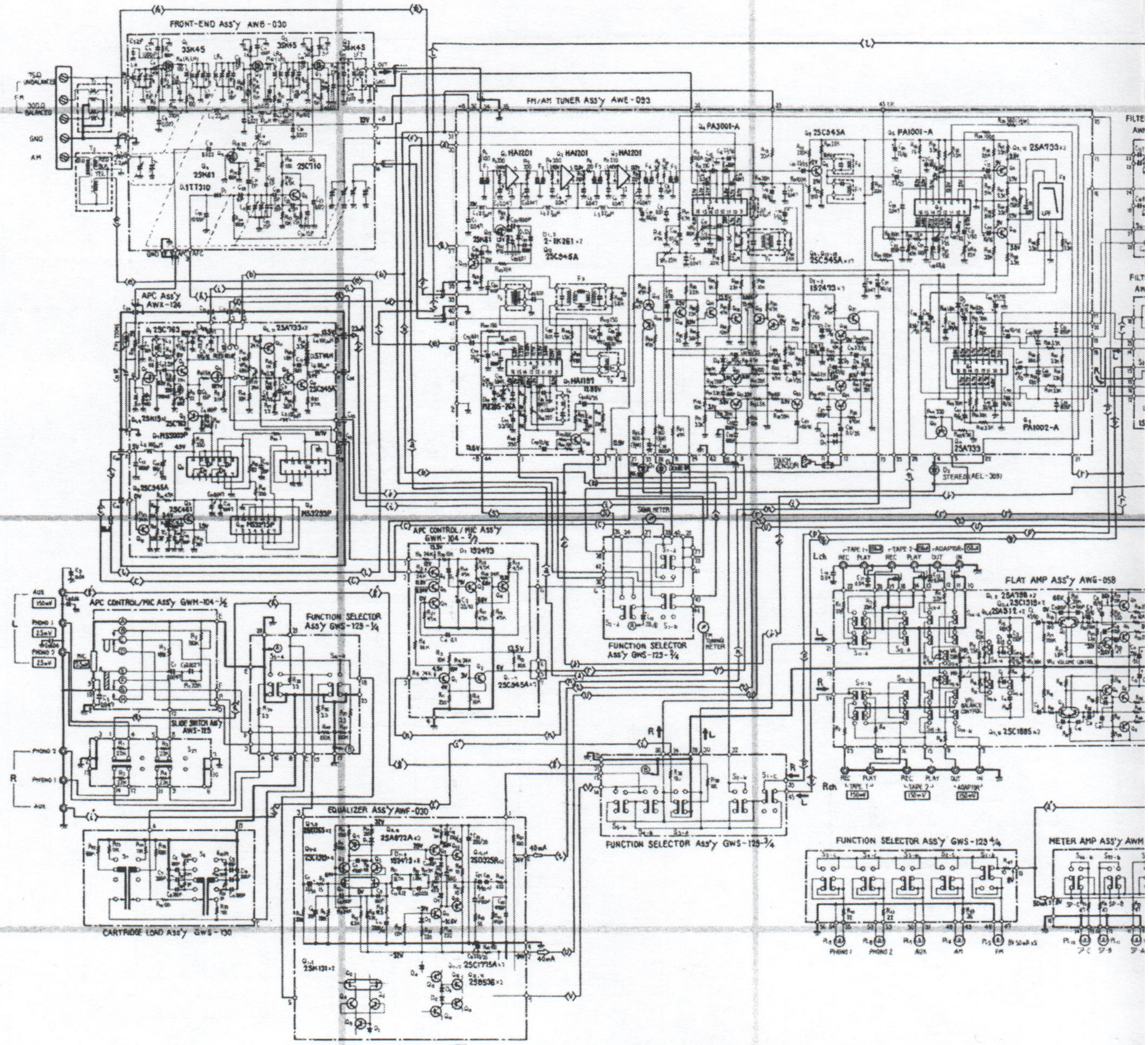


FM Front End (AWB-030)

- *Defective front ends should be replaced altogether.*

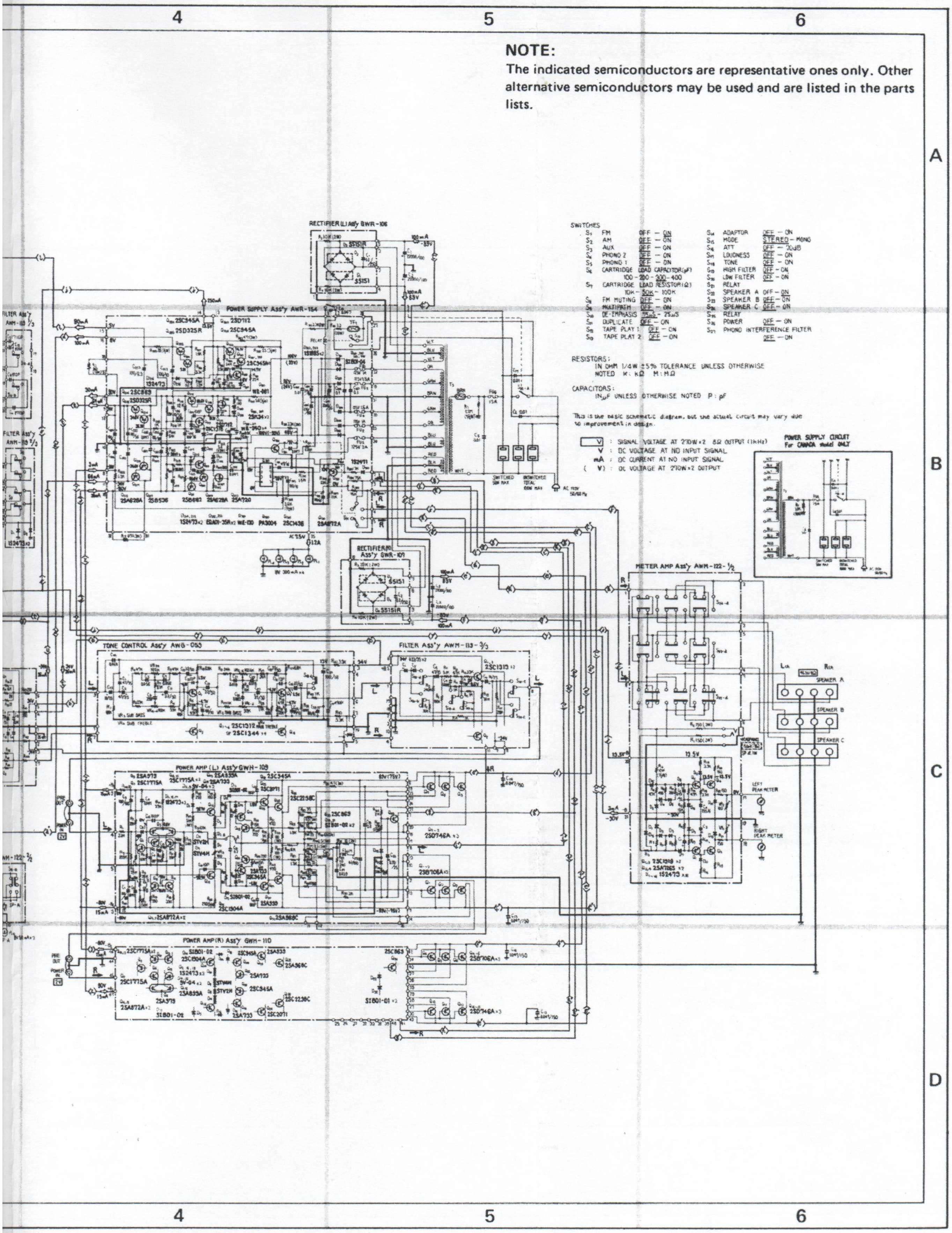

Q₁ 3SK45
Q₂ 3SK45
Q₃ 3SK45
INPUT 75Ω
AGC
AM₁
AM₂
AM₃
OUTPUT 300 Ω
-B (13V)
APC OUT
AFC
R₄ 100
C₂ 47P
C₄ 1000P
C₁ 15P
R₂ 100K
R₁ 100K
C₃ 2P
R₃ 47K
C₆ 0.022
R₅ 100
C₅ 0.022
R₂₅ 330K
L₁ 22μH
C₇ 18P
C₈ 18P
R₈ 15K
C₉ 3P
C₁₀ 0.022
R₁₀ 47
R₉ 47K
C₁₂ 0.022
R₁₁ 100
L₂ 22μH
L₃ 22μH
C₁₉ 0.022
C₂₀ 0.022
L₄ 22μH
C₁₄ 5P
C₁₃ 18P
R₁₄ 560
R₁₅ 15K
C₁₅ 3P
R₁₂ 100
R₁₃ 47K
R₁₆ 220
C₁₆ 0.022
C₁₇ 47P
R₁₇ 220
IFT
C₁₈ 0.022
Q₄ 2SK61
R₁₈ 1K
C₃₂ 0.022
C₂₁ 0.022
R₃₀ 100
C₂₃ 0.022
Q₅
R₃₁ 47K
C₂₅ 47P
C₂₆ 12P
C₂₇ 1P
C₃₁ 2P
R₃₄ 100K
R₁₉ 100K
C₂₉ 8P
D₁
C₃₀ 1000P
C₂₇ 15P
C₂₈ 22P
L₀
Q₅ 2SC710
R₂₂ 12K
C₂₄ 15P
R₂₃ 10K
D₁ ITT310 or IVS69

12.2 SCHEMATIC DIAGRAM


1
2
3
A
B
C
D
FRONT-END Ass'y AWB-030
3SK45
2SK61
2SC710
1T310
75Ω UNBALANCED
300Ω BALANCED
FM
GND
AM
FM/AM TUNER Ass'y AWE-093
HA1201
PA3001-A
2SC545A
PA1001-A
2SA733
2SK61
1K261
HA1197
1S2473
PA1002-A
TOUCH SENSOR
STEREO
FILTER
APC Ass'y AWX-126
2SC763
2SA733
2SC945A
2SK134
MS3203P
SIGNAL METER
TUNING METER
APC CONTROL/MIC Ass'y GWM-104-1/2
APC CONTROL/MIC Ass'y GWM-104-2/2
FUNCTION SELECTOR Ass'y GWS-123-1/4
FUNCTION SELECTOR Ass'y GWS-123-2/4
FUNCTION SELECTOR Ass'y GWS-123-3/4
FUNCTION SELECTOR Ass'y GWS-123-4/4
SLIDE SWITCH Ass'y AWS-125
CARTRIDGE LOAD Ass'y GWS-130
EQUALIZER Ass'y AWF-030
2SA872A
2SD325R
2SC1775A
2SB536
2SK131
FLAT AMP Ass'y AWG-058
2SC1885
VOLUME CONTROL
BALANCE CONTROL
METER AMP Ass'y AWM
AUX
PHONO 1
PHONO 2
MIC
Lch
Rch
L
R
REC
PLAY
TAPE 1
TAPE 2
ADAPTOR
OUT
IN
150mV
2.5mV
AUX
AM
FM
40mA

NOTE:

The indicated semiconductors are representative ones only. Other alternative semiconductors may be used and are listed in the parts lists.


4
5
6
A
B
C
D
RECTIFIER (L) Ass'y GWR-106
POWER SUPPLY Ass'y AWR-154
RECTIFIER (R) Ass'y GWR-107
TONE CONTROL Ass'y AWG-053
FILTER Ass'y AWM-113-3/3
FILTER Ass'y AWM-113-2/3
METER AMP Ass'y AWM-122-1/2
POWER AMP (L) Ass'y GWH-109
POWER AMP (R) Ass'y GWH-110
SPEAKER A
SPEAKER B
SPEAKER C
LEFT PEAK METER
RIGHT PEAK METER
AC 120V 50/60Hz
SWITCHED 50W MAX
UNSWITCHED TOTAL 600W MAX
POWER SUPPLY CIRCUIT For CANADA model ONLY

SWITCHES
S1 FM OFF — ON
S2 AM OFF — ON
S3 AUX OFF — ON
S4 PHONO 2 OFF — ON
S5 PHONO 1 OFF — ON
S6 CARTRIDGE LOAD CAPACITOR(pF) 100 - 200 - 300 - 400
S7 CARTRIDGE LOAD RESISTOR(Ω) 10K - 50K - 100K
S8 FM MUTING OFF — ON
S9 MULTIPATH OFF — ON
S10 DE-EMPHASIS 75μS - 25μS
S11 DUPLICATE OFF — ON
S12 TAPE PLAY 1 OFF — ON
S13 TAPE PLAY 2 OFF — ON
S14 ADAPTOR OFF — ON
S15 MODE STEREO — MONO
S16 ATT OFF — 20dB
S17 LOUDNESS OFF — ON
S18 TONE OFF — ON
S19 HIGH FILTER OFF — ON
S20 LOW FILTER OFF — ON
S21 RELAY
S22 SPEAKER A OFF — ON
S23 SPEAKER B OFF — ON
S24 SPEAKER C OFF — ON
S25 RELAY
S26 POWER OFF — ON
S27 PHONO INTERFERENCE FILTER OFF — ON

RESISTORS:
IN OHM 1/4W ±5% TOLERANCE UNLESS OTHERWISE NOTED K: kΩ M: MΩ

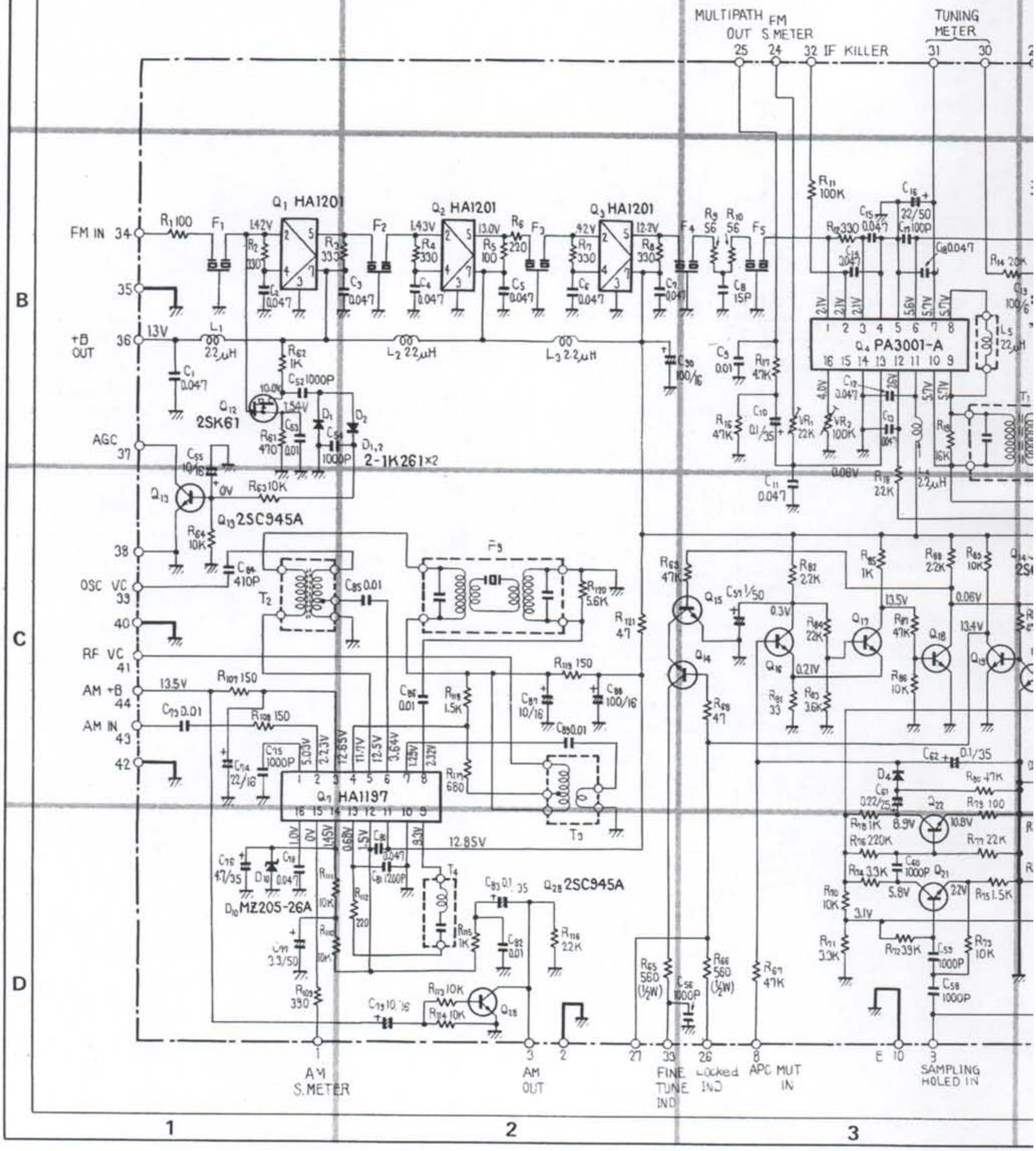
CAPACITORS:
IN μF UNLESS OTHERWISE NOTED P: pF

This is the basic schematic diagram, but the actual circuit may vary due to improvement in design.

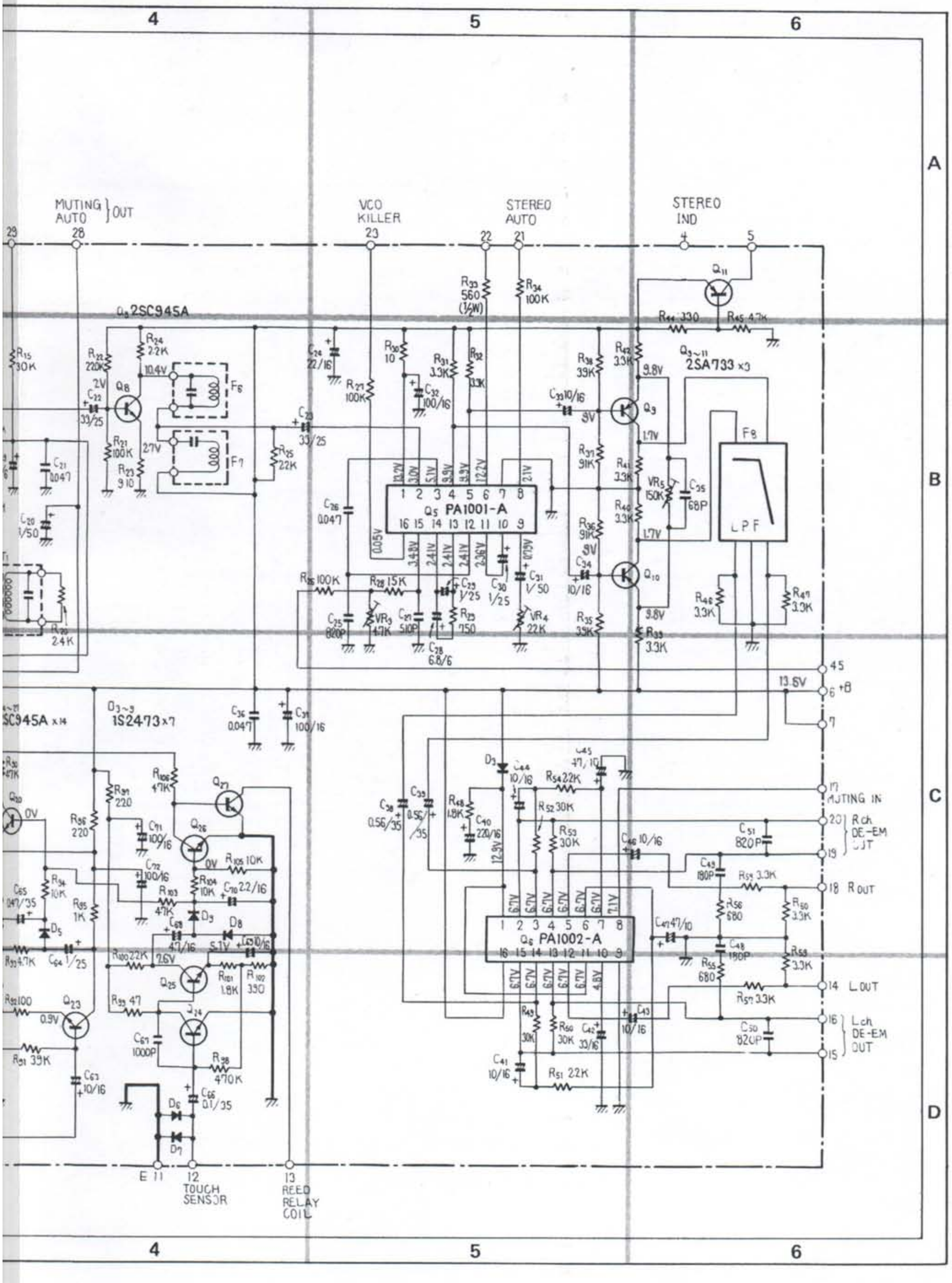
$\boxed{\quad V}$: SIGNAL VOLTAGE AT 270W×2 8Ω OUTPUT (1kHz)
V : DC VOLTAGE AT NO INPUT SIGNAL
mA : DC CURRENT AT NO INPUT SIGNAL
(V) : DC VOLTAGE AT 270W×2 OUTPUT

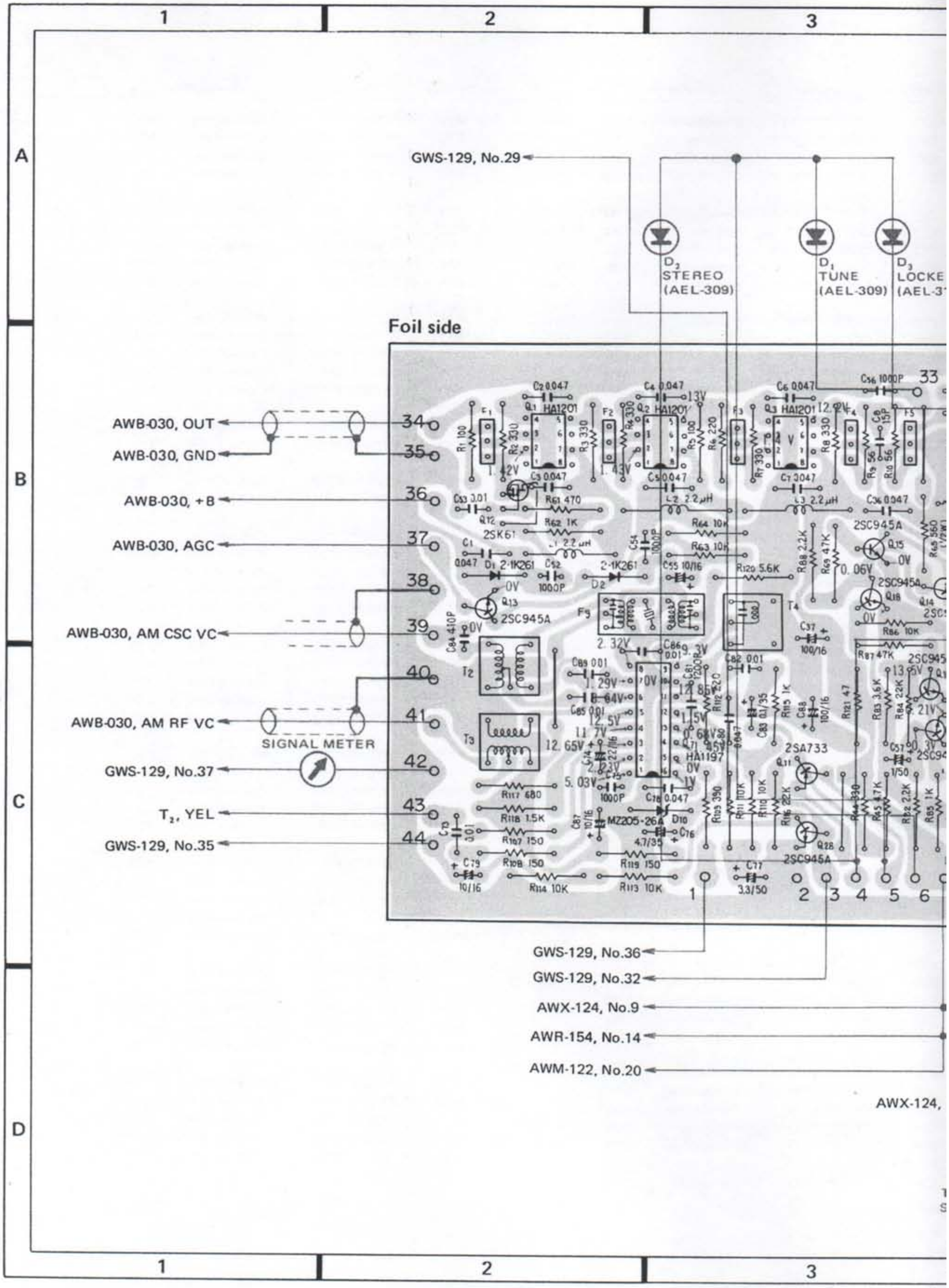
12.3 TUNER ASSEMBLY (AWE-093)

NOTICE:
The FM ceramic filter (ATF-050) symbol No. F1~F5 in the tuner assembly (AWE-093) and the crystal resonator (ASS-004) symbol No. X1 in the APC assembly (AWX-124), are being graded in 3 ranks and marked in Orange, Red and Blue dots respectively by their characteristics.
When replacing, use those dotted in the same color.

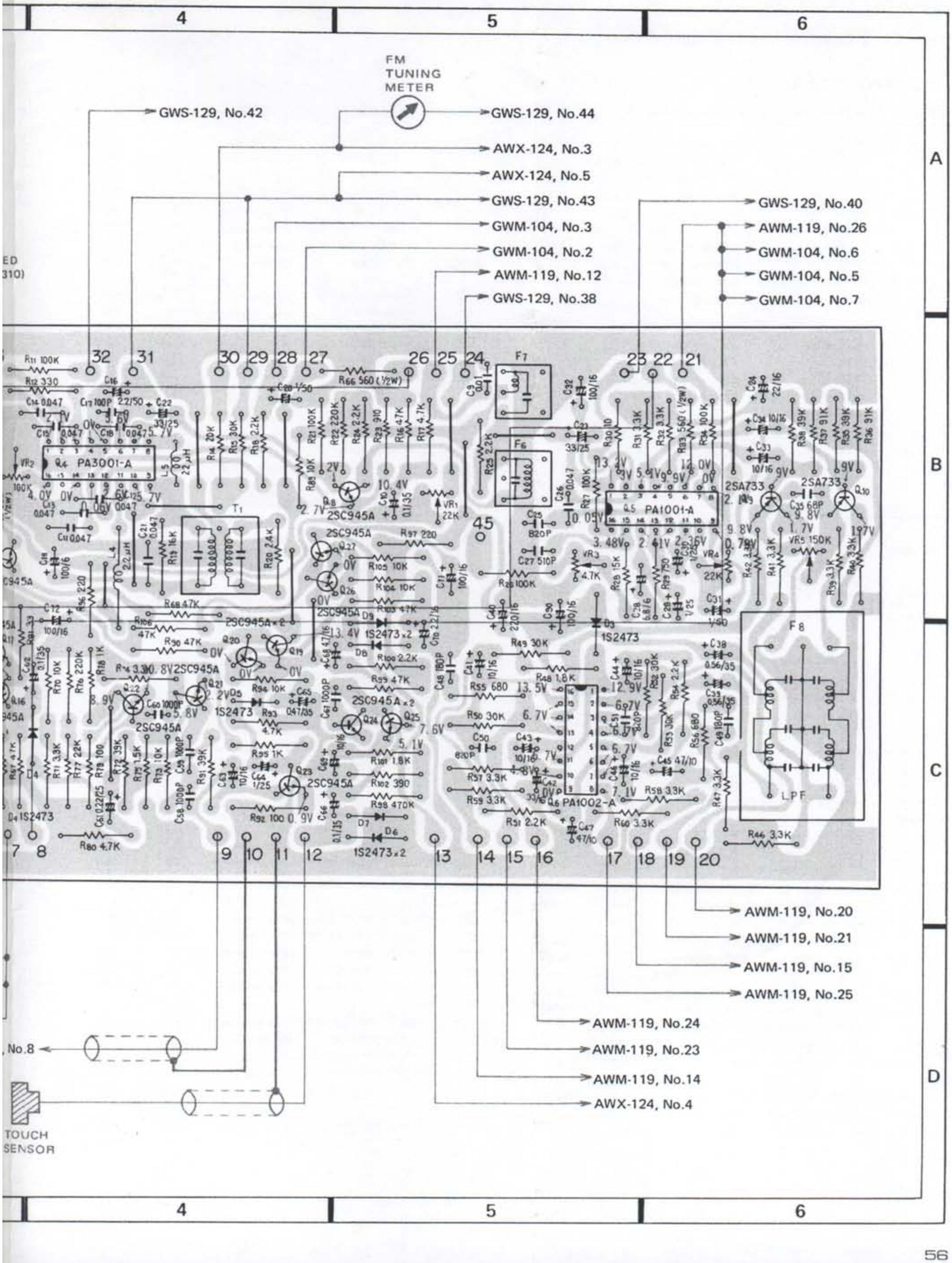


MULTIPATH OUT 25
FM S.METER 24
32 IF KILLER
TUNING METER 31 30
FM IN 34
35
+B OUT 36
AGC 37
38
OSC VC 39
40
RF VC 41
AM +B 44
AM IN 43
42
R1 100
F1 F2 F3 F4 F5
Q1 HA1201
Q2 HA1201
Q3 HA1201
R2 330
R3 33
R4 330
R5 100
R6 220
R7 330
R8 330
R9 56
R10 56
C2 0.047
C3 0.047
C4 0.047
C5 0.047
C6 0.047
C7 0.047
C8 15P
1.42V 1.43V 13.0V 1.42V 12.7V
13V
L1 2.2μH
L2 2.2μH
L3 2.2μH
C1 0.047
R62 1K
C52 1000P
Q12 2SK61
10.0V 1.54V
R61 470
C53 0.01
C54 1000P
D1 D2
D1,2 2-1K261×2
C55 10/16
0V
R63 10K
Q13 2SC945A
R64 10K
C84 410P
T2
C85 0.01
F9
R120 5.6K
R121 47
C50 100/16
R107 150
13.5V
C73 0.01
R108 150
C74 22/16
C75 1000P
Q7 HA1197
5.03V 2.23V 12.85V 11.7V 12.5V 3.64V 1.25V 2.32V
1.0V 0V 14.5V 0.68V 1.5V 9.3V
C86 0.01
R118 1.5K
R119 150
C87 10/16
C88 100/16
C89 0.01
R117 680
T3
12.85V
C80 0.047
C81 1200P
T4
C76 47/35
D10 MZ205-26A
C78 0.047
R111 10K
R112 220
R110 10K
C77 3.3/50
R109 330
C83 0.1 35
Q28 2SC945A
R115 1K
C82 0.01
R116 22K
R113 10K
R114 10K
C79 10/16
Q28
1 AM S.METER
3 AM OUT
2
R11 100K
C15 0.047
C16 22/50
C17 100P
R12 330
C14 3.047
C18 0.047
R14 20K
C19 100/6
L5 22μH
2.1V 2.1V 2.1V 5.6V 5.7V 5.7V
Q4 PA3001-A
C9 0.01
R17 47K
R16 47K
C10 0.1/35
VR1 22K
VR2 100K
C12 0.047
C13 0.047
4.0V 3.6V 5.7V 5.7V
R15 16K
T1
0.06V
R18 2.2K
L4 2.2μH
C11 0.047
R65 47K
Q15
C57 1/50
0.3V
R82 2.2K
R84 22K
Q16
0.21V
R81 33
R83 3.6K
Q17
R85 1K
13.5V
R87 47K
R86 10K
Q18
R88 2.2K
R89 10K
0.06V
13.4V
Q19
Q14
R68 47
C62 0.1/35
D4
R80 47K
C61 0.22/25
Q22
R79 100
R78 1K
8.9V
10.8V
R76 220K
R77 22K
R74 3.3K
C60 1000P
Q21
5.8V
2.2V
R75 1.5K
R70 10K
3.1V
R71 3.3K
R72 39K
C59 1000P
R73 10K
C58 1000P
R65 560 (½W)
C56 1000P
R66 560 (½W)
R67 47K
27
33 FINE TUNE IND
26 Locked IND
8 APC MUT IN
E 10
3 SAMPLING HOLED IN
A B C D
1 2 3


4
5
6
A
B
C
D
MUTING AUTO } OUT
29
28
VCO KILLER
23
22
STEREO AUTO
21
STEREO IND
4
5
Q₈ 2SC945A
R₁₅ 30K
R₂₂ 220K
R₂₄ 2.2K
10.4V
2V
C₂₂ 33/25
Q₈
F₆
F₇
R₂₁ 100K
R₂₃ 910
2.7V
C₂₁ 0.047
C₂₀ 1/50
R₂₀ 2.4K
C₂₃ 33/25
R₂₅ 22K
C₂₄ 22/16
R₂₇ 100K
R₃₀ 10
R₃₁ 3.3K
R₃₂ 3.3K
C₃₂ 100/16
R₃₃ 560 (1/2W)
R₃₄ 100K
C₂₆ 0.047
Q₅ PA1001-A
1 2 3 4 5 6 7 8
16 15 14 13 12 11 10 9
13.2V
3.0V
5.1V
9.9V
9.3V
12.2V
2.1V
0.05V
3.48V
2.41V
2.41V
2.41V
2.36V
10.9V
R₂₆ 100K
R₂₈ 15K
C₂₉ 1/25
C₃₀ 1/25
C₃₁ 1/50
C₂₅ 820P
VR₃ 4.7K
C₂₇ 510P
C₂₈ 6.8/6
R₂₉ 750
VR₄ 22K
Q₁₁
R₄₄ 330
R₄₅ 4.7K
Q₉~₁₁ 2SA733 ×3
R₃₈ 39K
R₄₂ 3.3K
9.8V
C₃₃ 10/16
9V
Q₉
1.7V
R₃₇ 91K
R₄₁ 3.3K
VR₅ 150K
C₃₅ 68P
F₈
LPF
R₄₀ 3.3K
R₃₆ 91K
9V
1.7V
C₃₄ 10/16
Q₁₀
R₄₆ 3.3K
R₄₇ 3.3K
9.8V
R₃₅ 39K
R₃₉ 3.3K
45
13.6V
6 +B
7
Q₂~₂₇ 2SC945A ×14
D₃~₉ 1S2473 ×7
C₃₆ 0.047
C₃₇ 100/16
R₉₀ 4.7K
Q₂₀
0V
R₉₇ 220
R₉₆ 220
R₁₀₆ 4.7K
Q₂₇
C₇₁ 100/16
Q₂₆
C₇₂ 100/16
0V
R₁₀₅ 10K
R₁₀₄ 10K
C₇₀ 22/16
R₉₄ 10K
R₉₅ 1K
C₆₅ 0.47/35
D₅
R₁₀₃ 4.7K
D₉
D₈
C₆₉ 47/16
5.1V
C₆₈ 10/16
R₉₃ 4.7K
C₆₄ 1/25
R₁₀₀ 2.2K
7.6V
Q₂₅
R₁₀₁ 1.8K
R₁₀₂ 390
R₉₂ 100
Q₂₃
0.9V
R₉₉ 47
Q₂₄
C₆₇ 1000P
R₉₁ 3.9K
C₆₃ 10/16
R₉₈ 470K
C₆₆ 0.1/35
D₆
D₇
E 11
12 TOUCH SENSOR
13 REED RELAY COIL
D₂
C₄₄ 10/16
C₄₅ 47/10
R₅₄ 2.2K
C₃₈ 0.56/35
C₃₉ 0.56/35
R₄₈ 1.8K
C₄₀ 220/16
12.3V
R₅₂ 30K
R₅₃ 30K
C₄₆ 10/16
17 MUTING IN
20 Rch DE-EM OUT
19
C₅₁ 820P
C₄₉ 180P
R₅₉ 3.3K
18 R OUT
R₅₆ 680
R₅₀ 3.3K
6.7V
6.7V
6.7V
6.7V
6.7V
6.7V
7.1V
Q₆ PA1002-A
1 2 3 4 5 6 7 8
16 15 14 13 12 11 10 9
C₄₇ 47/10
C₄₈ 180P
R₅₅ 680
R₅₈ 3.3K
6.7V
6.7V
6.7V
6.7V
6.7V
4.8V
14 L OUT
R₅₇ 3.3K
R₄₉ 30K
R₆₀ 30K
C₄₂ 33/16
C₄₃ 10/16
16 Lch DE-EM OUT
15
C₅₀ 820P
C₄₁ 10/16
R₅₁ 2.2K



1
2
3
A
B
C
D
GWS-129, No.29
D2 STEREO (AEL-309)
D1 TUNE (AEL-309)
D3 LOCKE
(AEL-3
Foil side
AWB-030, OUT
AWB-030, GND
AWB-030, +B
AWB-030, AGC
AWB-030, AM CSC VC
AWB-030, AM RF VC
SIGNAL METER
GWS-129, No.37
T2, YEL
GWS-129, No.35
34
35
36
37
38
39
40
41
42
43
44
33
1
2
3
4
5
6
Q1 HA1201
Q2 HA1201
Q3 HA1201
Q12 2SK61
Q13 2SC945A
Q15 2SC945A
Q18 2SC945A
Q14
Q11 2SA733
Q28 2SC945A
HA1197
MZ205-26A D10
D1 2-1K261
D2 2-1K261
F1
F2
F3
F4
F5
F9
T2
T3
T4
L1 2.2μH
L2 2.2μH
L3 2.2μH
C2 0.047
C4 0.047
C6 0.047
C3 0.047
C5 0.047
C7 0.047
C36 0.047
C56 1000P
C8 15P
C53 0.01
C1 0.047
C12 1000P
C54 1000P
C55 10/16
C84 410P
C89 0.01
C85 0.01
C86 0.01
C82 0.01
C81 1200P
C83 0.1/35
C88 100/16
C37 100/16
C57 1/50
C74 22/16
C75 1000P
C78 0.047
C76 4.7/35
C87 10/16
C73 0.01
C79 10/16
C77 3.3/50
R1 100
R2 330
R3 330
R4 330
R5 100
R6 220
R7 330
R8 330
R9 56
R10 56
R61 470
R62 1K
R64 10K
R63 10K
R120 5.6K
R68 2.2K
R69 4.7K
R65 560 (1/2W)
R86 10K
R87 47K
R112 220
R115 1K
R121 47
R83 3.6K
R84 22K
R117 680
R118 1.5K
R107 150
R108 150
R119 150
R114 10K
R113 10K
R105 330
R111 10K
R110 10K
R116 22K
R44 330
R45 4.7K
R82 2.2K
R85 1K
13V
12.9V
1.42V
1.43V
0V
0.06V
2.32V
9.3V
1.29V
1.64V
12.5V
11.7V
12.65V
2.23V
5.03V
12.8V
1.5V
0.68V
1V
13.5V
21V
0.3V
GWS-129, No.36
GWS-129, No.32
AWX-124, No.9
AWR-154, No.14
AWM-122, No.20
AWX-124,


4
5
6
A
B
C
D
FM TUNING METER
GWS-129, No.42
GWS-129, No.44
AWX-124, No.3
AWX-124, No.5
GWS-129, No.43
GWM-104, No.3
GWM-104, No.2
AWM-119, No.12
GWS-129, No.38
GWS-129, No.40
AWM-119, No.26
GWM-104, No.6
GWM-104, No.5
GWM-104, No.7
ED
310)
32 31 30 29 28 27 26 25 24 23 22 21
F7
F6
F8
T1
L.P.F
Q4 PA3001-A
Q5 PA1001-A
Q6 PA1002-A
2SC945A
2SA733
1S2473
2SC945A x2
1S2473 x2
VR1 22K
VR3 4.7K
VR4 22K
VR5 150K
45
7 8 9 10 11 12 13 14 15 16 17 18 19 20
AWM-119, No.20
AWM-119, No.21
AWM-119, No.15
AWM-119, No.25
AWM-119, No.24
AWM-119, No.23
AWM-119, No.14
AWX-124, No.4
, No.8
TOUCH SENSOR

Parts List of tuner Assembly (AWE-093)

COILS AND FILTERS

Symbol	Part No.	Description	
L1	T24-028	RF choke coil	2.2μH
L2	T24-028	RF choke coil	2.2μH
L3	T24-028	RF choke coil	2.2μH
L4	T24-028	RF choke coil	2.2μH
L5	ATH-019	Microinductor	22μH
T1	ATE-040	FM DET coil	
T2	ATB-019	AM OSC coil	
T3	ATB-052	AM RF coil	
T4	ATF-039	455kHz filter	
F1	ATF-050	FM ceramic filter	
F2	ATF-050	FM ceramic filter	
F3	ATF-050	FM ceramic filter	
F4	ATF-050	FM ceramic filter	
F5	ATF-050	FM ceramic filter	
F6	ATF-023	Unti-birdy filter	
F7	ATF-024	Unti-birdy filter	
F8	ATF-047	Low pass filter	

CAPACITORS

Symbol	Part No.	Description		
C1	CKDBC 473Z 25	Ceramic	0.047	25V
C2	CKDBC 473Z 25	Ceramic	0.047	25V
C3	CKDBC 473Z 25	Ceramic	0.047	25V
C4	CKDBC 473Z 25	Ceramic	0.047	25V
C5	CKDBC 473Z 25	Ceramic	0.047	25V
C6	CKDBC 473Z 25	Ceramic	0.047	25V
C7	CKDBC 473Z 25	Ceramic	0.047	25V
C8	CCDSL 150K 50	Ceramic	15p	50V
C9	CKDYF 103Z 50	Ceramic	0.01	50V
C10	CSZA 0R1M 35	Electrolytic	0.1	35V
C11	CKDBC 473Z 25	Ceramic	0.047	25V
C12	CKDBC 473Z 25	Ceramic	0.047	25V
C13	CKDBC 473Z 25	Ceramic	0.047	25V
C14	CKDBC 473Z 25	Ceramic	0.047	25V
C15	CKDBC 473Z 25	Ceramic	0.047	25V
C16	CEA 2R2P 50	Electrolytic	2.2	50V
C17	CCDSL 101K 50	Ceramic	100p	50V
C18	CKDBC 473Z 25	Ceramic	0.047	25V
C19	CEA 101P 6	Electrolytic	100	6V
C20	CEA 010P 50	Electrolytic	1	50V
C21	CKDBC 473Z 25	Ceramic	0.047	25V
C22	CEANL 330P 25	Electrolytic	33	25V
C23	CEANL 330P 25	Electrolytic	33	25V
C24	CEA 220P 16	Electrolytic	22	16V
C25	CKDYB 821K 50	Ceramic	820p	50V
C26	CQMA 473J 50	Mylar	0.047	50V
C27	CQSH 511J 50	Polystyrene	510p	50V
C28	CSZA 6R8M 6	Electrolytic	6.8	6V
C29	CSZA 010M 25	Electrolytic	1	25V
C30	CSZA 010M 25	Electrolytic	1	25V
C31	CEA 010P 50	Electrolytic	1	50V
C32	CEA 101P 16	Electrolytic	100	16V
C33	CEANL 100P 16	Electrolytic	10	16V
C34	CEANL 100P 16	Electrolytic	10	16V
C35	CCDSL 680K 50	Ceramic	68p	50V
C36	CKDBC 473Z 25	Ceramic	0.047	25V
C37	CEA 101P 16	Electrolytic	100	16V
C38	CSZA R56K 35	Electrolytic	0.56	35V
C39	CSZA R56K 35	Electrolytic	0.56	35V
C40	CEA 221P 16	Electrolytic	220	16V
C41	CEA 100P 16	Electrolytic	10	16V
C42	CEA 330P 16	Electrolytic	33	16V
C43	CEANL 100P 16	Electrolytic	10	16V
C44	CEA 100P 16	Electrolytic	10	16V
C45	CEA 470P 10	Electrolytic	47	10V
C46	CEANL 100P 16	Electrolytic	10	16V
C47	CEA 470P 10	Electrolytic	47	10V
C48	CCDSL 181K 50	Ceramic	180p	50V
C49	CCDSL 181K 50	Ceramic	180p	50V
C50	CQSA 821G 50	Polystyrene	820p	50V
C51	CQSA 821G 50	Polystyrene	820p	50V
C52	CKDYB 102K 50	Ceramic	0.001	50V
C53	CKDYF 103Z 50	Ceramic	0.01	50V
C54	CKDYB 102K 50	Ceramic	0.001	50V
C55	CEA 100P 16	Electrolytic	10	16V
C56	CKDYB 102K 50	Ceramic	0.001	50V
C57	CEA 010P 50	Electrolytic	1	50V
C58	CQSA 102J 50	Polystyrene	1000p	50V
C59	CQSA 102J 50	Polystyrene	1000p	50V
C60	CQSA 102J 50	Polystyrene	1000p	50V
C61	CSZA R22M 35	Electrolytic	0.22	35V
C62	CSZA 0R1M 35	Electrolytic	0.1	35V
C63	CEA 100P 16	Electrolytic	10	16V
C64	CSZA 010M 25	Electrolytic	1	25V
C65	CSZA R47M 35	Electrolytic	0.47	35V
C66	CSZA 0R1M 35	Electrolytic	0.1	35V
C67	CKDYB 102K 50	Ceramic	0.001	50V
C68	CSZA 4R7M 16	Electrolytic	4.7	16V
C69	CEA 100P 16	Electrolytic	10	16V
C70	CSZA 2R2M 16	Electrolytic	2.2	16V
C71	CEA 101P 16	Electrolytic	100	16V
C72	CEA 101P 16	Electrolytic	100	16V
C73	CKDYF 103Z 50	Ceramic	0.01	50V
C74	CEA 220P 16	Electrolytic	22	16V
C75	CKDYB 102K 50	Ceramic	0.001	50V
C76	CEA 4R7P 35	Electrolytic	4.7	35V

Symbol	Part No.	Description		
C77	CEA 3R3P 50	Electrolytic	3.3	50V
C78	CKDBC 473Z 25	Ceramic	0.047	25V
C79	CEA 100P 16	Electrolytic	10	16V
C80	CKDBC 473Z 25	Ceramic	0.047	25V
C81	CKDYB 122K 50	Ceramic	0.0012	50V
C82	CKDYF 103Z 50	Ceramic	0.01	50V
C83	CSZA 0R1M 35	Electrolytic	0.1	35V
C84	CQSA 411J 50	Polystyrene	410p	50V
C85	CKDYF 103Z 50	Ceramic	0.01	50V
C86	CKDYF 103Z 50	Ceramic	0.01	50V
C87	CEA 100P 16	Electrolytic	10	16V
C88	CEA 101P 16	Electrolytic	100	16V
C89	CKDYF 103Z 50	Ceramic	0.01	50V
C90	CEA 101P 16	Electrolytic	100	16V

RESISTORS

Symbol	Part No.	Description	
VR1	ACP-056	Semi-fixed	(22k-B)
VR2	C92-047	Semi-fixed	(100k-B)
VR3	ACP-018	Semi-fixed	(4.7k-B)
VR4	ACP-056	Semi-fixed	(22k-B)
VR5	ACP-014	Semi-fixed	(150k-B)
R1	RD¼PS 101J	Carbon film	100
R2	RD¼PS 331J	Carbon film	330
R3	RD¼PS 331J	Carbon film	330
R4	RD¼PS 331J	Carbon film	330
R5	RD¼PS 101J	Carbon film	100
R6	RD¼PS 221J	Carbon film	220
R7	RD¼PS 331J	Carbon film	330
R8	RD¼PS 331J	Carbon film	330
R9	RD¼PS 560J	Carbon film	56
R10	RD¼PS 560J	Carbon film	56
R11	RD¼PS 104J	Carbon film	100k
R12	RD¼PS 331J	Carbon film	330
R13			
R14	RD¼PS 203J	Carbon film	20k
R15	RD¼PS 303J	Carbon film	30k
R16	RD¼PS 473J	Carbon film	47k
R17	RD¼PS 472J	Carbon film	4.7k
R18	RD¼PS 222J	Carbon film	2.2k
R19	RD¼PS 163J	Carbon film	16k
R20	RD¼PS 242J	Carbon film	2.4k
R21	RD¼PS 104J	Carbon film	100k
R22	RD¼PS 224J	Carbon film	220k
R23	RD¼PS 911J	Carbon film	910
R24	RD¼PS 222J	Carbon film	2.2k
R25	RD¼PS 222J	Carbon film	2.2k
R26	RD¼PS 104J	Carbon film	100k
R27	RD¼PS 104J	Carbon film	100k
R28	RN¼PR 1502F	Metal film	15k
R29	RD¼PS 751J	Carbon film	750
R30	RD¼PSF 100J	Carbon film	10
R31	RD¼PS 332J	Carbon film	3.3k
R32	RD¼PS 332J	Carbon film	3.3k
R33	RD¼PS 561J	Carbon film	560
R34	RD¼PS 104J	Carbon film	100k
R35	RD¼PS 393J	Carbon film	39k
R36	RD¼PS 913J	Carbon film	91k
R37	RD¼PS 913J	Carbon film	91k
R38	RD¼PS 393J	Carbon film	39k
R39	RD¼PS 332J	Carbon film	3.3k
R40	RD¼PS 332J	Carbon film	3.3k
R41	RD¼PS 332J	Carbon film	3.3k
R42	RD¼PS 332J	Carbon film	3.3k
R43			
R44	RD¼PS 331J	Carbon film	330
R45	RD¼PS 472J	Carbon film	4.7k
R46	RD¼PS 332J	Carbon film	3.3k
R47	RD¼PS 332J	Carbon film	3.3k
R48	RD¼PS 182J	Carbon film	1.8k
R49	RD¼PS 303J	Carbon film	30k
R50	RD¼PS 303J	Carbon film	30k
R51	RD¼PS 222J	Carbon film	2.2k
R52	RD¼PS 303J	Carbon film	30k
R53	RD¼PS 303J	Carbon film	30k
R54	RD¼PS 222J	Carbon film	2.2k
R55	RD¼PS 681J	Carbon film	680
R56	RD¼PS 681J	Carbon film	680
R57	RD¼PS 332J	Carbon film	3.3k
R58	RD¼PS 332J	Carbon film	3.3k
R59	RD¼PS 332J	Carbon film	3.3k
R60	RD¼PS 332J	Carbon film	3.3k
R61	RD¼PS 471J	Carbon film	470
R62	RD¼PS 102J	Carbon film	1k
R63	RD¼PS 103J	Carbon film	10k
R64	RD¼PS 103J	Carbon film	10k
R65	RD½PS 561J	Carbon film	560
R66	RD½PS 561J	Carbon film	560
R67	RD¼PS 473J	Carbon film	47k
R68	RD¼PS 473J	Carbon film	47k
R69	RD¼PS 473J	Carbon film	47k
R70	RD¼PS 103J	Carbon film	10k
R71	RD¼PS 332J	Carbon film	3.3k
R72	RD¼PS 393J	Carbon film	39k
R73	RD¼PS 103J	Carbon film	10k
R74	RD¼PS 332J	Carbon film	3.3k
R75	RD¼PS 152J	Carbon film	1.5k

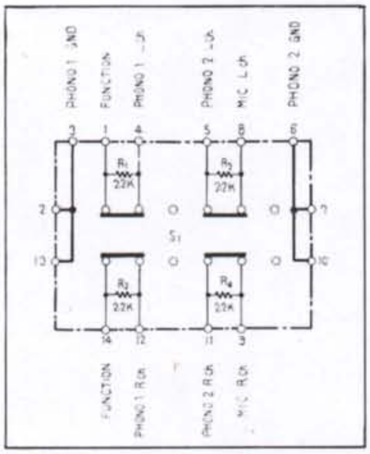
Symbol	Part No.	Description	
R76	RD¼PS 224J	Carbon film	220k
R77	RD¼PS 223J	Carbon film	22k
R78	RD¼PS 102J	Carbon film	1k
R79	RD¼PS 101J	Carbon film	100
R80	RD¼PS 472J	Carbon film	4.7k
R81	RD¼PS 330J	Carbon film	33
R82	RD¼PS 222J	Carbon film	2.2k
R83	RD¼PS 362J	Carbon film	3.6k
R84	RD¼PS 223J	Carbon film	22k
R85	RD¼PS 102J	Carbon film	1k
R86	RD¼PS 103J	Carbon film	10k
R87	RD¼PS 473J	Carbon film	47k
R88	RD¼PS 222J	Carbon film	2.2k
R89	RD¼PS 103J	Carbon film	10k
R90	RD¼PS 473J	Carbon film	47k
R91	RD¼PS 393J	Carbon film	39k
R92	RD¼PS 101J	Carbon film	100
R93	RD¼PS 472J	Carbon film	4.7k
R94	RD¼PS 103J	Carbon film	10k
R95	RD¼PS 102J	Carbon film	1k
R96	RD¼PSF 221J	Carbon film	220
R97	RD¼PSF 221J	Carbon film	220
R98	RD¼PS 474J	Carbon film	470k
R99	RD¼PS 473J	Carbon film	47k
R100	RD¼PS 222J	Carbon film	2.2k
R101	RD¼PS 182J	Carbon film	1.8k
R102	RD¼PS 391J	Carbon film	390
R103	RD¼PS 473J	Carbon film	47k
R104	RD¼PS 103J	Carbon film	10k
R105	RD¼PS 103J	Carbon film	10k
R106	RD¼PS 473J	Carbon film	47k
R107	RD¼PSF 151J	Carbon film	150
R108	RD¼PS 151J	Carbon film	150
R109	RD¼PS 391J	Carbon film	390
R110	RD¼PS 103J	Carbon film	10k
R111	RD¼PS 103J	Carbon film	10k
R112	RD¼PS 221J	Carbon film	220
R113	RD¼PS 103J	Carbon film	10k
R114	RD¼PS 103J	Carbon film	10k
R115	RD¼PS 102J	Carbon film	1k
R116	RD¼PS 223J	Carbon film	22k
R117	RD¼PS 681J	Carbon film	680
R118	RD¼PS 152J	Carbon film	1.5k
R119	RD¼PSF 151J	Carbon film	150
R120	RD¼PS 562J	Carbon film	5.6k
R121	RD¼PSF 470J	Carbon film	47

SEMICONDUCTORS

Symbol	Part No.	Description
Q1	HA1201	IC
Q2	HA1201	IC
Q3	HA1201	IC
Q4	PA3001-A	IC
Q5	PA1001-A	IC
Q6	PA1002-A	IC
Q7	HA1197	IC
Q8	2SC945A-Q or R (2SC1914A-F)	Transistor
Q9	2SA733-Q or R (2SA904A-F)	Transistor
Q10	2SA733-Q or R (2SA904A-F)	Transistor
Q11	2SA733-Q or R (2SA904A-F)	Transistor
Q12	2SK61-Y or GR	FET
Q13	2SC945A-Q or R (2SC1914A-F)	Transistor
Q14	2SC945A-Q or R (2SC1914A-F)	Transistor
Q15	2SC945A-Q or R (2SC1914A-F)	Transistor
Q16	2SC945A-Q or R (2SC1914A-F)	Transistor
Q17	2SC945A-Q or R (2SC1914A-F)	Transistor
Q18	2SC945A-Q or R (2SC1914A-F)	Transistor
Q19	2SC945A-Q or R (2SC1914A-F)	Transistor
Q20	2SC945A-Q or R (2SC1914A-F)	Transistor
Q21	2SC945A-Q or R (2SC1914A-F)	Transistor
Q22	2SC945A-Q or R (2SC1914A-F)	Transistor
Q23	2SC945A-Q or R (2SC1914A-F)	Transistor
Q24	2SC945A-Q or R (2SC1914A-F)	Transistor
Q25	2SC945A-Q or R (2SC1914A-F)	Transistor
Q26	2SC945A-Q or R (2SC1914A-F)	Transistor
Q27	2SC945A-Q or R (2SC1914A-F)	Transistor
Q28	2SC945A-Q or R (2SC1914A-F)	Transistor
D1	2-1K261	Diode
D2	2-1K261	Diode
D3	1S2473 (1S1555)	Diode
D4	1S2473 (1S1555)	Diode

Symbol	Part No.	Description
D5	1S2473 (1S1555)	Diode
D6	1S2473 (1S1555)	Diode
D7	1S2473 (1S1555)	Diode
D8	1S2473 (1S1555)	Diode
D9	1S2473 (1S1555)	Diode
D10	MZ205-26A	Zener diode

12.4 SLIDE SWITCH ASSEMBLY (AWS-125)


PHONO 1 GND
FUNCTION
PHONO 1 L ch
PHONO 2 L ch
MIC L ch
PHONO 2 GND
3
1
4
5
8
6
R1 2.2K
R3 2.2K
2
7
S1
13
10
R2 2.2K
R4 2.2K
14
12
11
9
FUNCTION
PHONO 1 R ch
PHONO 2 R ch
MIC R ch

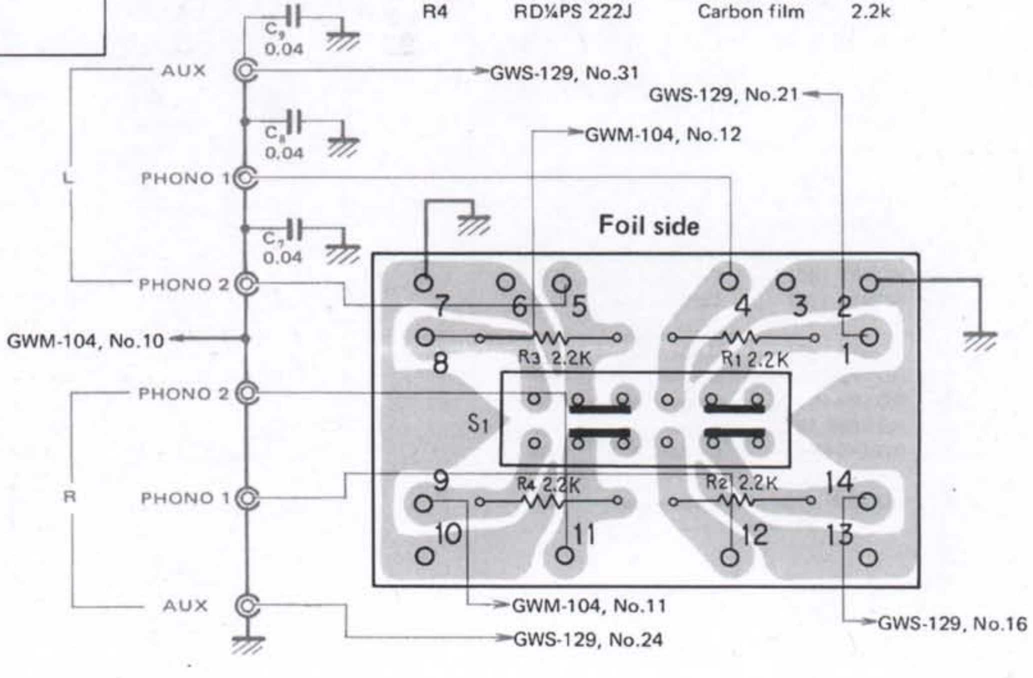
Parts List

SWITCH

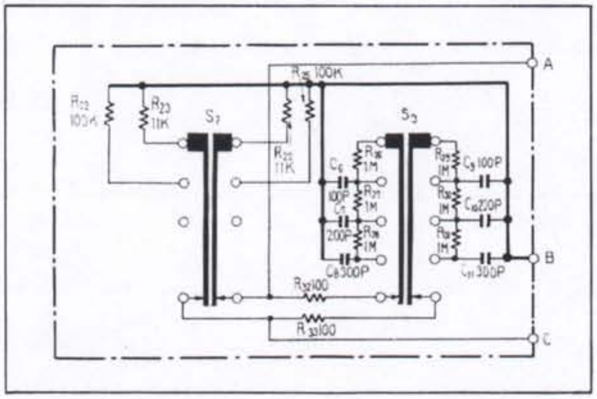
Symbol	Part No.	Description
S1	ASH-018	Slide switch (INTERFERENCE FILTER)

RESISTORS

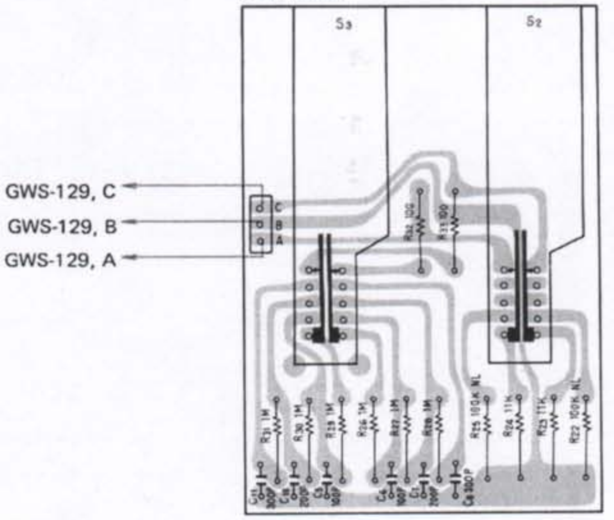
Symbol	Part No.	Description	
R1	RD¼PS 222J	Carbon film	2.2k
R2	RD¼PS 222J	Carbon film	2.2k
R3	RD¼PS 222J	Carbon film	2.2k
R4	RD¼PS 222J	Carbon film	2.2k


C9
0.04
AUX
GWS-129, No.31
GWS-129, No.21
C8
0.04
GWM-104, No.12
L
PHONO 1
C7
0.04
Foil side
PHONO 2
7
6
5
4
3
2
GWM-104, No.10
8
R3 2.2K
R1 2.2K
1
PHONO 2
S1
R
PHONO 1
9
R4 2.2K
R2 2.2K
14
10
11
12
13
AUX
GWM-104, No.11
GWS-129, No.24
GWS-129, No.16

12.5 CARTRIDGE LOAD ASSEMBLY (GWS-130)


A
R25 100K
R22 100K
R23 11K
S2
S3
R24 11K
C6
R26 1M
R29 1M
C9 100P
100P
R27 1M
C7
R30 1M
C10 200P
200P
R28 1M
R31 1M
C8 300P
C11 300P
B
R32 100
R33 100
C

Foil side


S3
S2
GWS-129, C
GWS-129, B
GWS-129, A
C
B
A
R32 100
R33 100
R31 1M
R30 1M
R29 1M
R26 1M
R27 1M
R28 1M
R25 100K NL
R24 11K
R23 11K
R22 100K NL
C11 300P
C10 200P
C9 100P
C6 100P
C7 200P
C8 300P

Parts List

SWITCHES

Symbol	Part No.	Description
S2	ASE-002	Slide rotary switch (kΩ)
S3	ASE-001	Slide rotary switch (pF)

CAPACITORS

Symbol	Part No.	Description		
C6	CQSH 101J 50	Polystyrene	100p	50V
C7	CQSH 201J 50	Polystyrene	200p	50V
C8	CQSH 301J 50	Polystyrene	300p	50V
C9	CQSH 101J 50	Polystyrene	100p	50V
C10	CQSH 201J 50	Polystyrene	200p	50V
C11	CQSH 301J 50	Polystyrene	300p	50V

RESISTORS

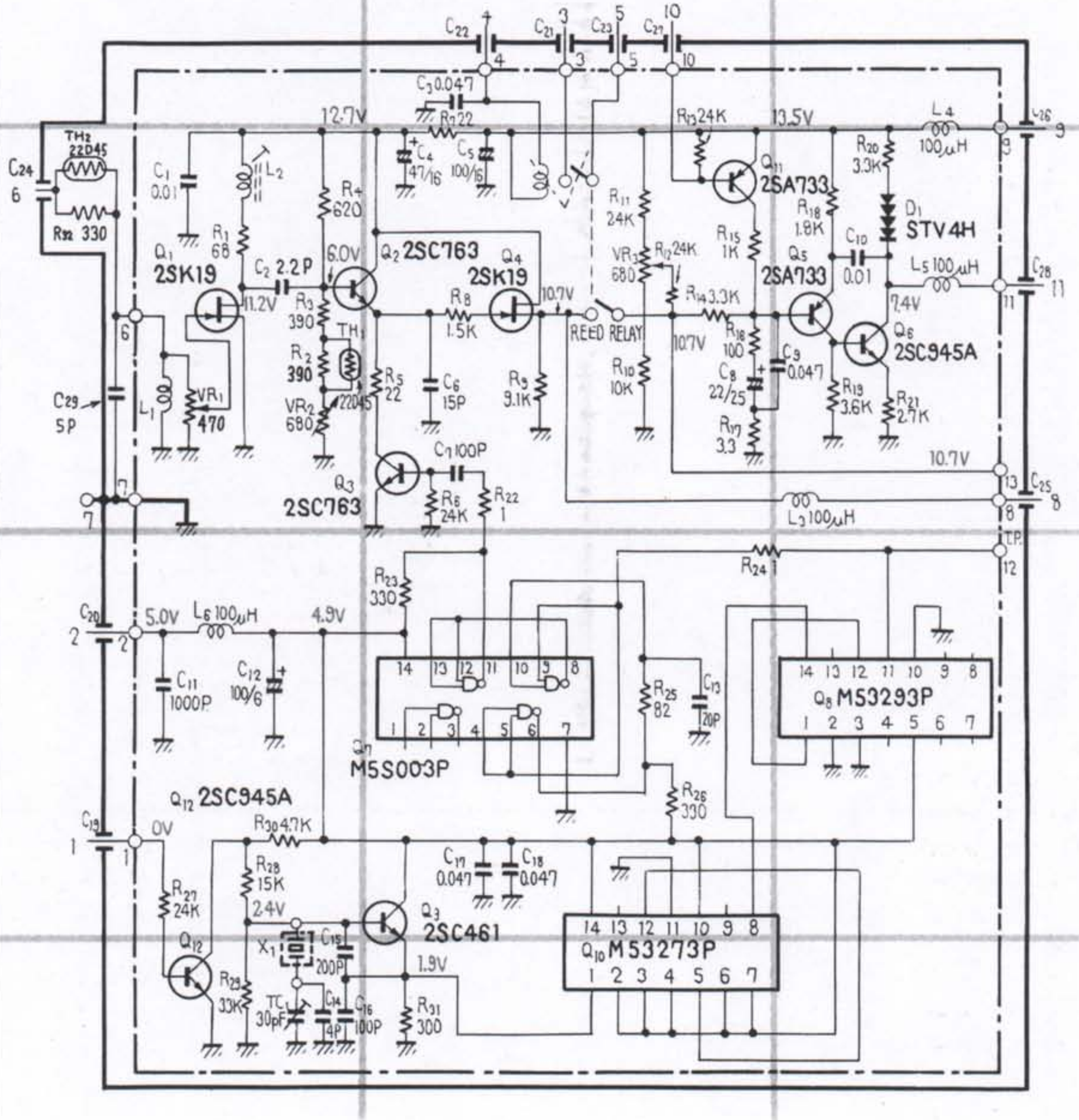
Symbol	Part No.	Description	
R22	RD¼PS 104J NL	Carbon film	100k
R23	RD¼PS 113J	Carbon film	11k
R24	RD¼PS 113J	Carbon film	11k
R25	RD¼PS 104J NL	Carbon film	100k
R26	RD¼PS 105J	Carbon film	1M
R27	RD¼PS 105J	Carbon film	1M
R28	RD¼PS 105J	Carbon film	1M
R29	RD¼PS 105J	Carbon film	1M
R30	RD¼PS 105J	Carbon film	1M
R31	RD¼PS 105J	Carbon film	1M
R32	RD¼PS 101J	Carbon film	100
R33	RD¼PS 101J	Carbon film	100

12.6 APC ASSEMBLY (AWX-124)

NOTICE:

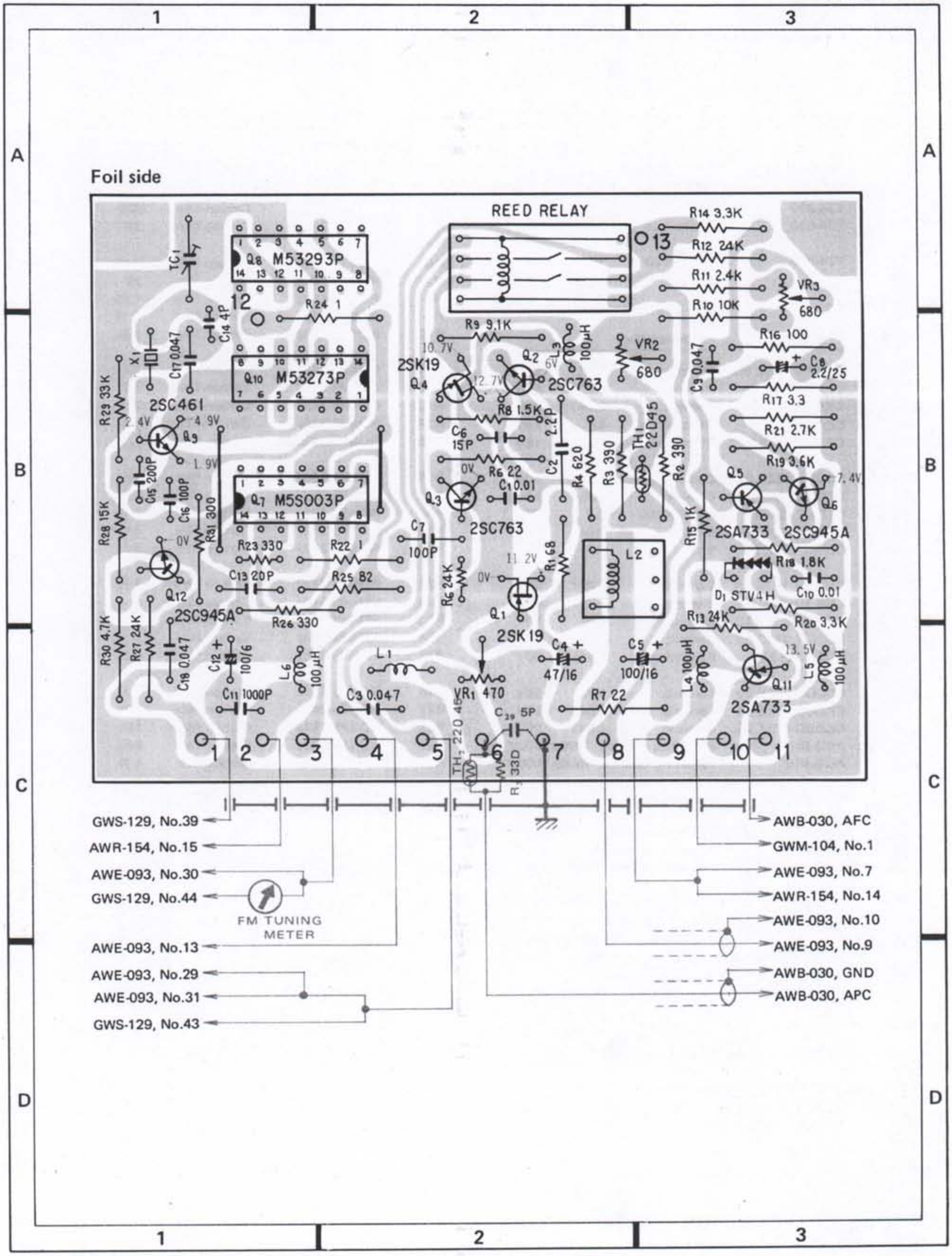
The FM ceramic filter (ATF-050) symbol No. F1~F5 in the tuner assembly (AWE-093) and the crystal resonator (ASS-004) symbol No. X1 in the APC assembly (AWX-124), are being graded in 3 ranks and marked in Orange, Red and Blue dots respectively by their characteristics.

When replacing, use those dotted in the same color.



1
2
3
A
B
C
D
C22
C21
C23
C27
4
3
5
10
C3 0.047
12.7V
R7 22
C4 47/16
C5 100/16
R13 24K
13.5V
L4 100μH
C26
9
TH2 22D45
C24 6
R32 330
C1 0.01
L2
R4 620
R1 68
Q1 2SK19
C2 2.2P
6.0V
Q2 2SC763
Q4 2SK19
10.7V
11.2V
R3 390
R8 1.5K
REED RELAY
R11 24K
VR3 680
R12 24K
R14 3.3K
10.7V
Q11 2SA733
R15 1K
R18 1.8K
Q5 2SA733
R20 3.3K
D1 STV4H
C10 0.01
L5 100μH
C28
11
7.4V
Q6 2SC945A
TH1
R2 390
VR2 680
22D45
R5 22
C6 15P
R9 9.1K
R10 10K
R16 100
C8 22/25
C9 0.047
R17 3.3
R19 3.6K
R21 2.7K
C29 5P
L1
VR1 470
6
7
C7 100P
Q3 2SC763
R6 24K
R22 1
10.7V
13
C25
8
L3 100μH
T.P.
12
R24 1
R23 330
C20
2
5.0V
L6 100μH
4.9V
C11 1000P
C12 100/6
14 13 12 11 10 9 8
1 2 3 4 5 6 7
Q7 M5S003P
R25 82
C13 20P
Q8 M53293P
R26 330
Q12 2SC945A
C19
1
0V
R30 4.7K
R28 15K
2.4V
C17 0.047
C18 0.047
R27 24K
X1
C15 200P
Q9 2SC461
1.9V
Q10 M53273P
Q12
R29 33K
TC1 30pF
C14 4P
C16 100P
R31 300

Foil side


1
2
3
A
B
C
D
REED RELAY
13
12
Q8 M53293P
Q10 M53273P
Q7 M5S003P
TC1
C14 4P
X1
C17 0.047
R24 1
R29 33K
2SC461
Q9
2.4V
4.9V
1.9V
C15 200P
C16 100P
R31 300
R28 15K
0V
Q12
2SC945A
R30 4.7K
R27 24K
C18 0.047
C12 + 100/6
L6 100μH
C11 1000P
R23 330
R22 1
C13 20P
R25 82
R26 330
L1
C3 0.047
R14 3.3K
R12 24K
R11 2.4K
R10 10K
VR3 680
R9 9.1K
L3 100μH
VR2 680
2SK19
Q4
10.7V
12.7V
Q2
6V
2SC763
R8 1.5K
C2 2.2P
C6 15P
R6 22
Q3
C10 0.01
2SC763
C7 100P
R4 620
R3 390
TH1 22D45
R2 390
R6 24K
0V
11.2V
R1 68
Q1
2SK19
L2
VR1 470
C4 + 47/16
C5 + 100/16
R7 22
C20 5P
TH2 220 45
R5 33D
C9 0.047
R16 100
C8 2.2/25
R17 3.3
R21 2.7K
R19 3.6K
Q5
Q6
7.4V
R15 1K
2SA733
2SC945A
R18 1.8K
D1 STV4H
C10 0.01
R13 24K
R20 3.3K
L4 100μH
13.5V
Q11
L5 100μH
2SA733
1
2
3
4
5
6
7
8
9
10
11
GWS-129, No.39
AWR-154, No.15
AWE-093, No.30
GWS-129, No.44
FM TUNING METER
AWE-093, No.13
AWE-093, No.29
AWE-093, No.31
GWS-129, No.43
AWB-030, AFC
GWM-104, No.1
AWE-093, No.7
AWR-154, No.14
AWE-093, No.10
AWE-093, No.9
AWB-030, GND
AWB-030, APC

Parts List of APC Assembly (AWX-124)

COILS

Symbol	Part No.	Description	
L1	ATC-055	EQ Coil	
L2	ATC-056	EQ Coil	
L3	T24-030	Choke Coil	100μH
L4	T24-030	Choke Coil	100μH
L5	T24-030	Choke Coil	100μH
L6	T24-030	Choke Coil	100μH

CAPACITORS

Symbol	Part No.	Description		
C1	CKDYF 103Z 50	Ceramic	0.01	50V
C2	CGB 2R2K 500	Ceramic	2.2p	500V
C3	CKDBC 473Z 25	Ceramic	0.047	25V
C4	CEA 470P 16	Electrolytic	47	16V
C5	CEA 101P 16	Electrolytic	100	16V
C6	CCDCH 150K 50	Ceramic	15p	50V
C7	CCDCH 101K 50	Ceramic	100p	50V
C8	CSZA 2R2M 25	Electrolytic	2.2	25V
C9	CQMA 473K 50	Mylar	0.047	50V
C10	CQMA 103K 50	Mylar	0.01	50V
C11	CKDYB 102K 50	Ceramic	0.001	50V
C12	CEA 101P 6	Electrolytic	100	6V
C13	CCDCH 200K 50	Ceramic	20p	50V
C14	CCDCH 040D 50	Ceramic	4p	50V
C15	CQSA 201J 50	Polystyrene	200p	50V
C16	CCDCH 101K 50	Ceramic	100p	50V
C17	CKDBC 473Z 25	Ceramic	0.047	25V
C18	CKDBC 473Z 25	Ceramic	0.047	25V
C19	ACG-010	Feed-thru ceramic	1000p	500V
C20	ACG-010	Feed-thru ceramic	1000p	500V
C21	ACG-010	Feed-thru ceramic	1000p	500V
C22	ACG-010	Feed-thru ceramic	1000p	500V
C23	ACG-010	Feed-thru ceramic	1000p	500V
C24	ACG-011	Feed-thru ceramic	1p	500V
C25	ACG-010	Feed-thru ceramic	1000p	500V
C26	ACG-010	Feed-thru ceramic	1000p	500V
C27	ACG-010	Feed-thru ceramic	1000p	500V
C28	ACG-010	Feed-thru ceramic	1000p	500V
C29	CCDSL 050D	Ceramic	5p	50V
TC1	ACM-010	Trimmer		

RESISTORS

Symbol	Part No.	Description	
VR1	ACP-006	Semi-fixed	(470-B)
VR2	ACP-031	Semi-fixed	(680-B)
VR3	ACP-031	Semi-fixed	(680-B)
R1	RD¼PS 680J	Carbon film	68
R2	RD¼PS 391J	Carbon film	390
R3	RD¼PS 391J	Carbon film	390
R4	RD¼PS 621J	Carbon film	620
R5	RD¼PS 220J	Carbon film	22
R6	RD¼VS 243J	Carbon film	2.4k
R7	RD¼PSF 220J	Carbon film	22
R8	RD¼PS 152J	Carbon film	1.5k
R9	RD¼PS 912J	Carbon film	9.1k
R10	RD¼PS 103J	Carbon film	10k
R11	RD¼PS 242J	Carbon film	2.4k
R12	RD¼PS 243J	Carbon film	24k
R13	RD¼PS 243J	Carbon film	24k
R14	RD¼PS 332J	Carbon film	3.3k
R15	RD¼PS 102J	Carbon film	1k
R16	RD¼PS 101J	Carbon film	100
R17	RD¼PS 3R3J	Carbon film	3.3
R18	RD¼PS 182J	Carbon film	1.8k
R19	RD¼PS 362J	Carbon film	3.6k
R20	RD¼PS 332J	Carbon film	3.3k
R21	RD¼PS 272J	Carbon film	2.7k
R22	RD¼PS 010J	Carbon film	1
R23	RD¼VS 331J	Carbon film	330
R24	RD¼PS 010J	Carbon film	1
R25	RD¼PS 820J	Carbon film	82
R26	RD¼PS 331J	Carbon film	330
R27	RD¼PS 243J	Carbon film	24k
R28	RD¼PS 153J	Carbon film	15k
R29	RD¼PS 333J	Carbon film	33k
R30	RD¼PS 472J	Carbon film	4.7k
R31	RD¼PS 301J	Carbon film	300
R32	RD¼PS 331J	Carbon film	330

OTHERS

Symbol	Part No.	Description
	AKP-023	Crystal resonator socket
	ASR-045	Reed relay

SEMICONDUCTORS

Symbol	Part No.	Description
Q1	2SK 19-BL	FET
Q2	2SC 763-C	Transistor
Q3	2SC 763-C	Transistor
Q4	2SK 19W	FET
Q5	2SA 733-Q or R (2SA 904A-F)	Transistor

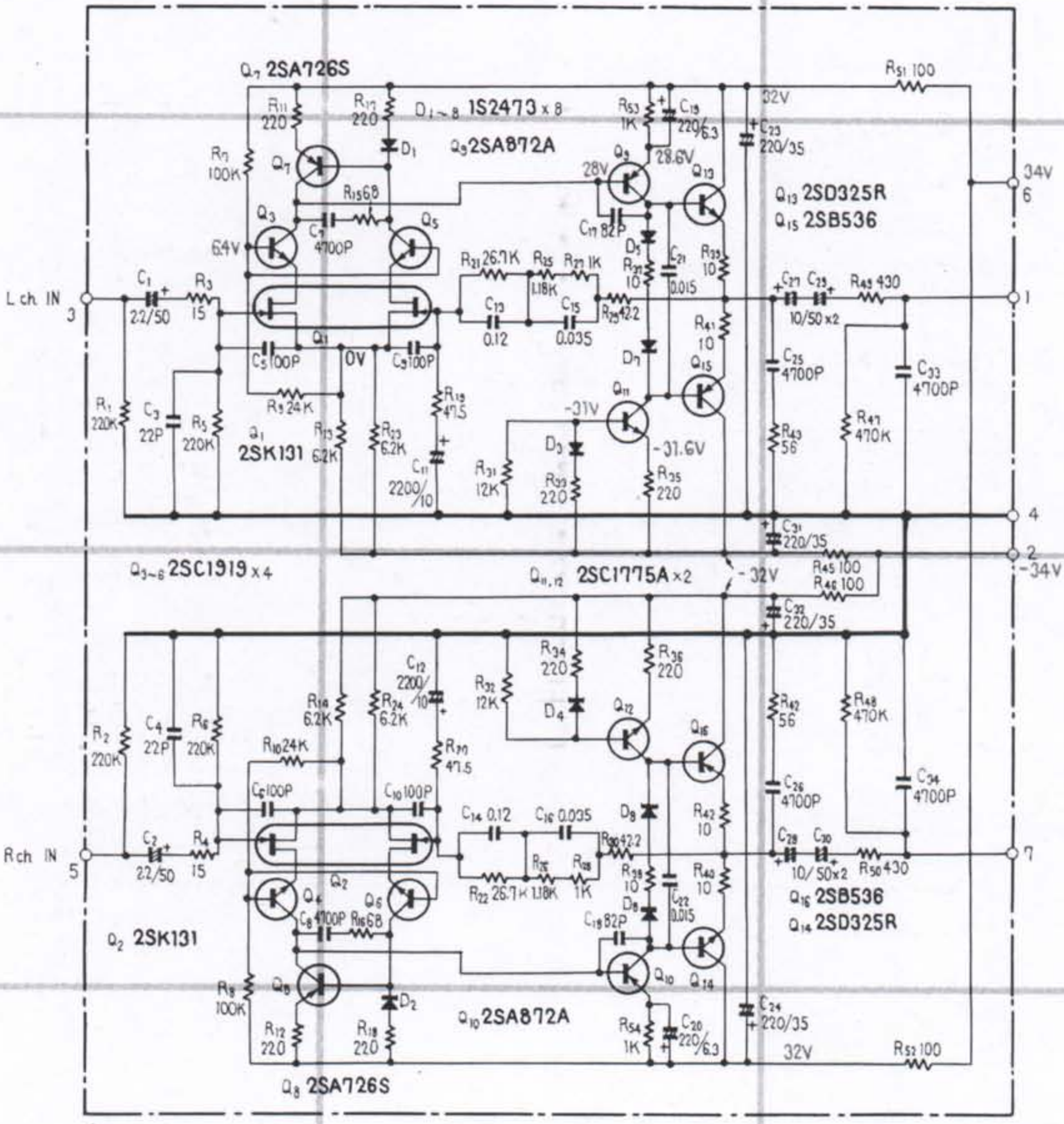
Symbol	Part No.	Description
Q6	2SC 945A-Q or R (2SC 1914A-F)	Transistor
Q7	M5S003P	IC
Q8	M53293P	IC
Q9	2SC 461-B	Transistor
Q10	M53273P	IC
Q11	2SA 733-Q or R (2SA 904A-F)	Transistor
D1	STV-4H	Varistor
TH1	22D45	Thermistor
TH2	22D45	Thermistor

Service information will be furnished whenever necessary and you are requested to amend parts number in this parts list.

List of Changed Parts for Factory Modification

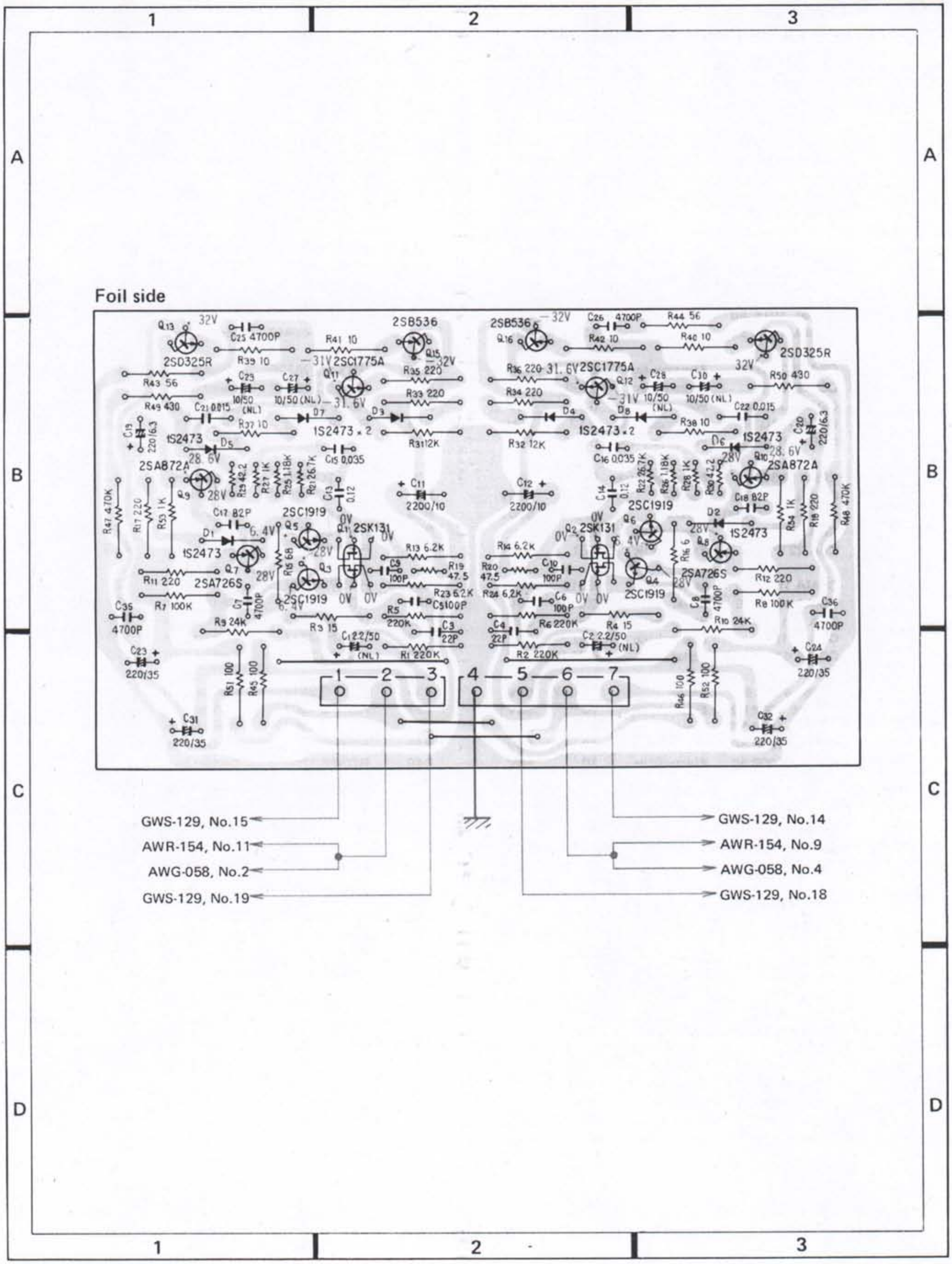
Symbol	Part No.	Description

12.7 EQ AMPLIFIER ASSEMBLY (AWF-030)



Q7 2SA726S
R11 220
R17 220
D1~8 1S2473 x 8
Q9 2SA872A
R53 1K
C19 220/6.3
32V
C23 220/35
R51 100
28.6V
28V
Q13
Q9
Q7
D1
R7 100K
R15 68
Q3
Q5
6.4V
C7 4700P
C17 82P
D5
R37 10
C21 0.015
R39 10
Q13 2SD325R
Q15 2SB536
34V
6
L ch. IN
3
C1 22/50
R3 15
Q1
R21 26.7K
R25 1.18K
R27 1K
C13 0.12
C15 0.035
R29 42.2
C27
C29
10/50 x 2
R49 430
1
C5 100P
0V
C9 100P
D7
R41 10
Q15
C25 4700P
C33 4700P
R9 24K
R19 47.5
Q11
-31V
R1 220K
C3 22P
R5 220K
Q1 2SK131
R13 6.2K
R23 6.2K
C11 2200/10
D3
-31.6V
R43 56
R47 470K
R31 12K
R33 220
R35 220
4
C31 220/35
R45 100
2
-34V
Q3~6 2SC1919 x 4
Q11, 12 2SC1775A x 2
-32V
R46 100
C32 220/35
R34 220
R36 220
C12 2200/10
R32 12K
D4
R14 6.2K
R24 6.2K
R42 56
R48 470K
R2 220K
C4 22P
R6 220K
R10 24K
R20 47.5
Q12
Q16
C6 100P
C10 100P
C14 0.12
C16 0.035
D8
R42 10
C26 4700P
C34 4700P
R ch IN
5
C2 22/50
R4 15
R30 42.2
R26
R28 1K
C28
C30
10/50 x 2
R50 430
7
R22 26.7K
1.18K
R38 10
R40 10
Q2
Q4
Q6
C8 4700P
R16 68
D6
C22 0.015
Q16 2SB536
Q14 2SD325R
Q2 2SK131
C18 82P
Q10
Q14
Q8
R8 100K
D2
C24 220/35
R12 220
R18 220
Q10 2SA872A
R54 1K
C20 220/6.3
32V
R52 100
Q8 2SA726S

Foil side


1
2
3
A
B
C
D
Q13
32V
C25 4700P
2SD325R
R39 10
R41 10
2SB536
Q15
-32V
-31V 2SC1775A
Q11
R43 56
R49 430
C23 10/50
C27 10/50 (NL)
-31.6V
R35 220
R33 220
C21 0.015
R37 10
D7
D3
1S2473 × 2
R31 12K
C19 220/6.3
1S2473
D5
28.6V
2SA872A
Q9
28V
R29 42.2
R27 1K
R25 1.18K
R21 26.7K
C15 0.035
C13 0.12
C11 2200/10
R47 470K
R17 220
R53 1K
C17 82P
D1
6.4V
1S2473
Q7
2SC1919
Q5
Q1 2SK131
0V
28V
Q3
R15 68
R13 6.2K
C9 100P
R19 47.5
R11 220
2SA726S
R7 100K
C7 4700P
2SC1919
R23 6.2K
C5 100P
C35 4700P
R9 24K
R3 15
R5 220K
C3 22P
C1 2.2/50 (NL)
R1 220K
C23 220/35
R51 100
R45 100
C31 220/35
2SB536
-32V
Q16
C26 4700P
R44 56
R42 10
R40 10
2SD325R
32V
R36 220
31.6V
2SC1775A
Q12
-31V
C28 10/50 (NL)
C30 10/50 (NL)
R50 430
R34 220
D4
D8
R38 10
C22 0.015
R32 12K
1S2473 × 2
C16 0.035
D6
1S2473
C20 220/6.3
R22 26.7K
R26 1.18K
R28 1K
R30 42.2
Q10
28.6V
2SA872A
C12 2200/10
C14 0.12
2SC1919
Q6
C18 82P
D2
1S2473
R54 1K
R18 220
R48 470K
Q2 2SK131
6.4V
Q8
R14 6.2K
C10 100P
R20 47.5
R16 68
2SA726S
R12 220
Q4
2SC1919
R24 6.2K
C6 100P
C8 4700P
R8 100K
C36 4700P
C4 22P
R6 220K
R4 15
R10 24K
C2 2.2/50 (NL)
R2 220K
C24 220/35
R46 100
R52 100
C32 220/35
1
2
3
4
5
6
7
GWS-129, No.15
AWR-154, No.11
AWG-058, No.2
GWS-129, No.19
GWS-129, No.14
AWR-154, No.9
AWG-058, No.4
GWS-129, No.18

Parts List of EQ Amplifier Assembly (AWF-030)

CAPACITORS

Symbol	Part No.	Description		
C1	CEANL 2R2P 50	Electrolytic	2.2	50V
C2	CEANL 2R2P 50	Electrolytic	2.2	50V
C3	CCDSL 220K 50	Ceramic	22p	50V
C4	CCDSL 220K 50	Ceramic	22p	50V
C5	CCDSL 101K 50	Ceramic	100p	50V
C6	CCDSL 101K 50	Ceramic	100p	50V
C7	CQMA 472K 50	Mylar	0.0047	50V
C8	CQMA 472K 50	Mylar	0.0047	50V
C9	CCDSL 101K 50	Ceramic	100p	50V
C10	CCDSL 101K 50	Ceramic	100p	50V
C11	CEA 222P 10	Electrolytic	2200	10V
C12	CEA 222P 10	Electrolytic	2200	10V
C13	CQPA 124G 50	Polypropylene	0.12	50V
C14	CQPA 124G 50	Polypropylene	0.12	50V
C15	CQPA 353G 50	Polypropylene	0.035	50V
C16	CQPA 353G 50	Polypropylene	0.035	50V
C17	CCDSL 820K 500	Ceramic	82p	500V
C18	CCDSL 820K 500	Ceramic	82p	500V
C19	CEA 221P 6	Electrolytic	220	6V
C20	CEA 221P 6	Electrolytic	220	6V
C21	CQMA 153K 50	Mylar	0.015	50V
C22	CQMA 153K 50	Mylar	0.015	50V
C23	CEA 221P 35	Electrolytic	220	35V
C24	CEA 221P 35	Electrolytic	220	35V
C25	CQMA 472K 50	Mylar	0.0047	50V
C26	CQMA 472K 50	Mylar	0.0047	50V
C27	CEANL 100P 50	Electrolytic	10	50V
C28	CEANL 100P 50	Electrolytic	10	50V
C29	CEANL 100P 50	Electrolytic	10	50V
C30	CEANL 100P 50	Electrolytic	10	50V
C31	CEA 221P 35	Electrolytic	220	35V
C32	CEA 221P 35	Electrolytic	220	35V
C33	CQMA 472K 50	Mylar	0.0047	50V
C34	CQMA 472K 50	Mylar	0.0047	50V

RESISTORS

Symbol	Part No.	Description		
R1	RD¼PS 224J NL	Carbon film	220k	
R2	RD¼PS 224J NL	Carbon film	220k	
R3	RD¼PS 150J	Carbon film	15	
R4	RD¼PS 150J	Carbon film	15	
R5	RD¼PS 224J NL	Carbon film	220k	
R6	RD¼PS 224J NL	Carbon film	220k	
R7	RD¼PS 104J NL	Carbon film	100k	
R8	RD¼PS 104J NL	Carbon film	100k	
R9	RD¼PS 243J	Carbon film	24k	
R10	RD¼PS 243J	Carbon film	24k	
R11	RD¼PS 221J	Carbon film	220	
R12	RD¼PS 221J	Carbon film	220	
R13	RD¼PS 622J	Carbon film	6.2k	
R14	RD¼PS 622J	Carbon film	6.2k	
R15	RD¼PS 680J	Carbon film	68	
R16	RD¼PS 680J	Carbon film	68	
R17	RD¼PS 221J	Carbon film	220	
R18	RD¼PS 221J	Carbon film	220	
R19	RN⅕SQ 47R5F	Metal film	47.5	⅕W
R20	RN⅕SQ 47R5F	Metal film	47.5	⅕W
R21	RN⅕SQ 2672F	Metal film	26.7k	⅕W
R22	RN⅕SQ 2672F	Metal film	26.7k	⅕W
R23	RD¼PS 622J	Carbon film	6.2k	
R24	RD¼PS 622J	Carbon film	6.2k	
R25	RN⅕SQ 1181F	Metal film	1.18k	⅕W
R26	RN⅕SQ 1181F	Metal film	1.18k	⅕W
R27	RN⅕SQ 1001F	Metal film	1k	⅕W
R28	RN⅕SQ 1001F	Metal film	1k	⅕W
R29	RN⅕SQ 42R2F	Metal film	42.2	⅕W
R30	RN⅕SQ 42R2F	Metal film	42.2	⅕W
R31	RD¼PS 123J	Carbon film	12k	
R32	RD¼PS 123J	Carbon film	12k	
R33	RD¼PS 221J	Carbon film	220	
R34	RD¼PS 221J	Carbon film	220	
R35	RD¼PS 221J	Carbon film	220	
R36	RD¼PS 221J	Carbon film	220	
R37	RD¼PS 100J	Carbon film	10	
R38	RD¼PS 100J	Carbon film	10	
R39	RD¼PS 100J	Carbon film	10	
R40	RD¼PS 100J	Carbon film	10	
R41	RD¼PS 100J	Carbon film	10	
R42	RD¼PS 100J	Carbon film	10	
R43	RD¼PS 560J	Carbon film	56	
R44	RD¼PS 560J	Carbon film	56	
R45	RD¼PSF 101J	Carbon film	100	
R46	RD¼PSF 101J	Carbon film	100	
R47	RD¼PS 474J	Carbon film	470k	
R48	RD¼PS 474J	Carbon film	470k	
R49	RD¼PS 431J	Carbon film	430	
R50	RD¼PS 431J	Carbon film	430	
R51	RD¼PSF 101J	Carbon film	100	
R52	RD¼PSF 101J	Carbon film	100	
R53	RD¼PS 102J	Carbon film	1k	
R54	RD¼PS 102J	Carbon film	1k	

OTHERS

Symbol	Part No.	Description
	AEC-352	Nylon rivet

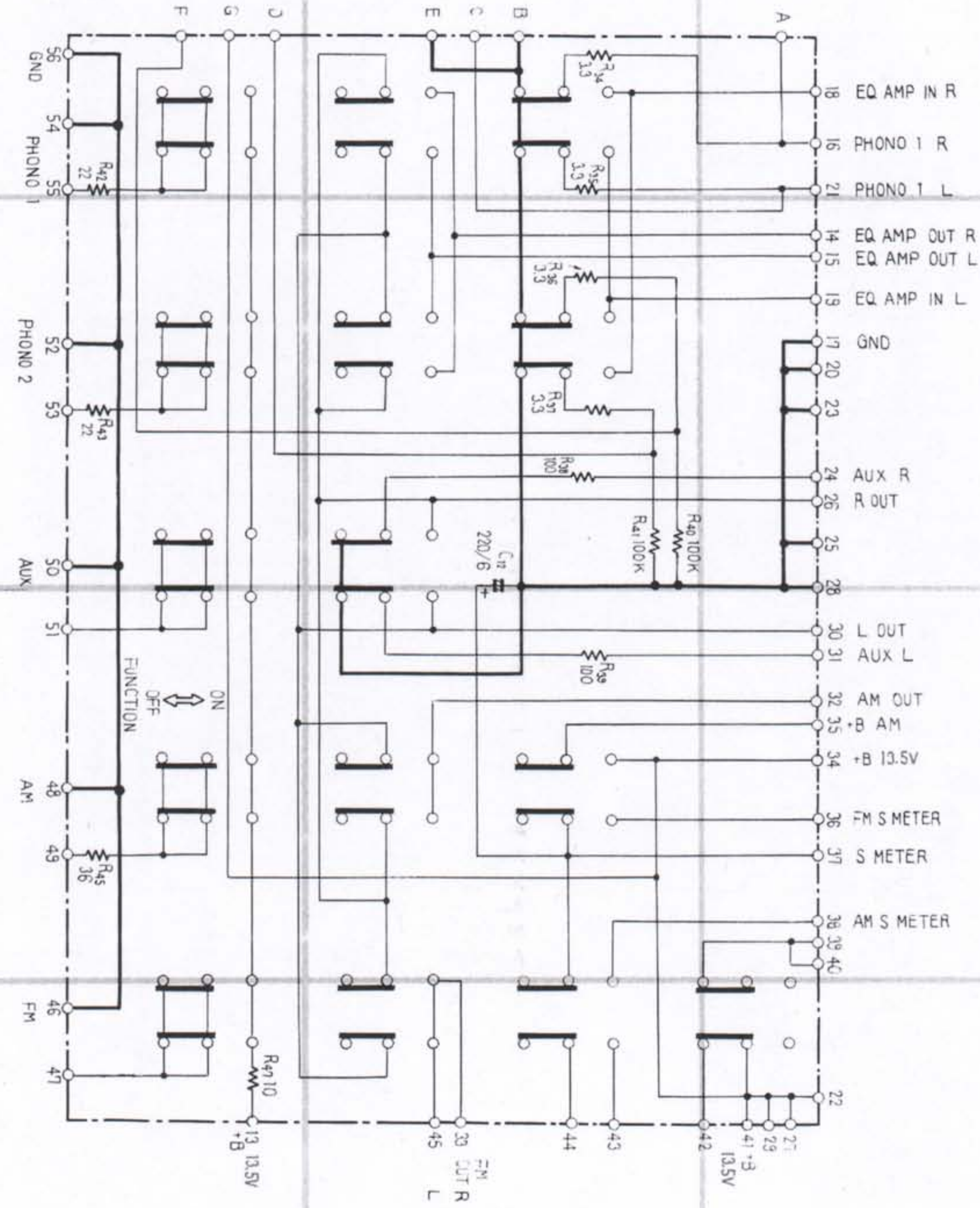
SEMICONDUCTORS

Symbol	Part No.	Description
Q1	2SK131-L,M or K	FET
Q2	2SK131-L,M or K	FET
Q3	2SC1919-G or F (2SC1400-F or E)	Transistor
Q4	2SC1919-G or F (2SC1400-F or E)	Transistor
Q5	2SC1919-G or F (2SC1400-F or E)	Transistor
Q6	2SC1919-G or F (2SC1400-F or E)	Transistor
Q7	2SA726S-G or F (2SA872A-E or D)	Transistor
Q8	2SA726S-G or F (2SA872A-E or D)	Transistor
Q9	2SA872A-E or D	Transistor
Q10	2SA872A-E or D	Transistor
Q11	2SC1775A-E or D	Transistor
Q12	2SC1775A-E or D	Transistor
Q13	2SD325R-D or E (2SC1913-Q or R)	Transistor
Q14	2SD325R-D or E (2SC1913-Q or R)	Transistor
Q15	2SB536-M or L (2SA913-Q or R)	Transistor
Q16	2SB536-M or L (2SA913-Q or R)	Transistor
D1	1S2473 (1S1555)	Diode
D2	1S2473 (1S1555)	Diode
D3	1S2473 (1S1555)	Diode
D4	1S2473 (1S1555)	Diode
D5	1S2473 (1S1555)	Diode
D6	1S2473 (1S1555)	Diode
D7	1S2473 (1S1555)	Diode
D8	1S2473 (1S1555)	Diode

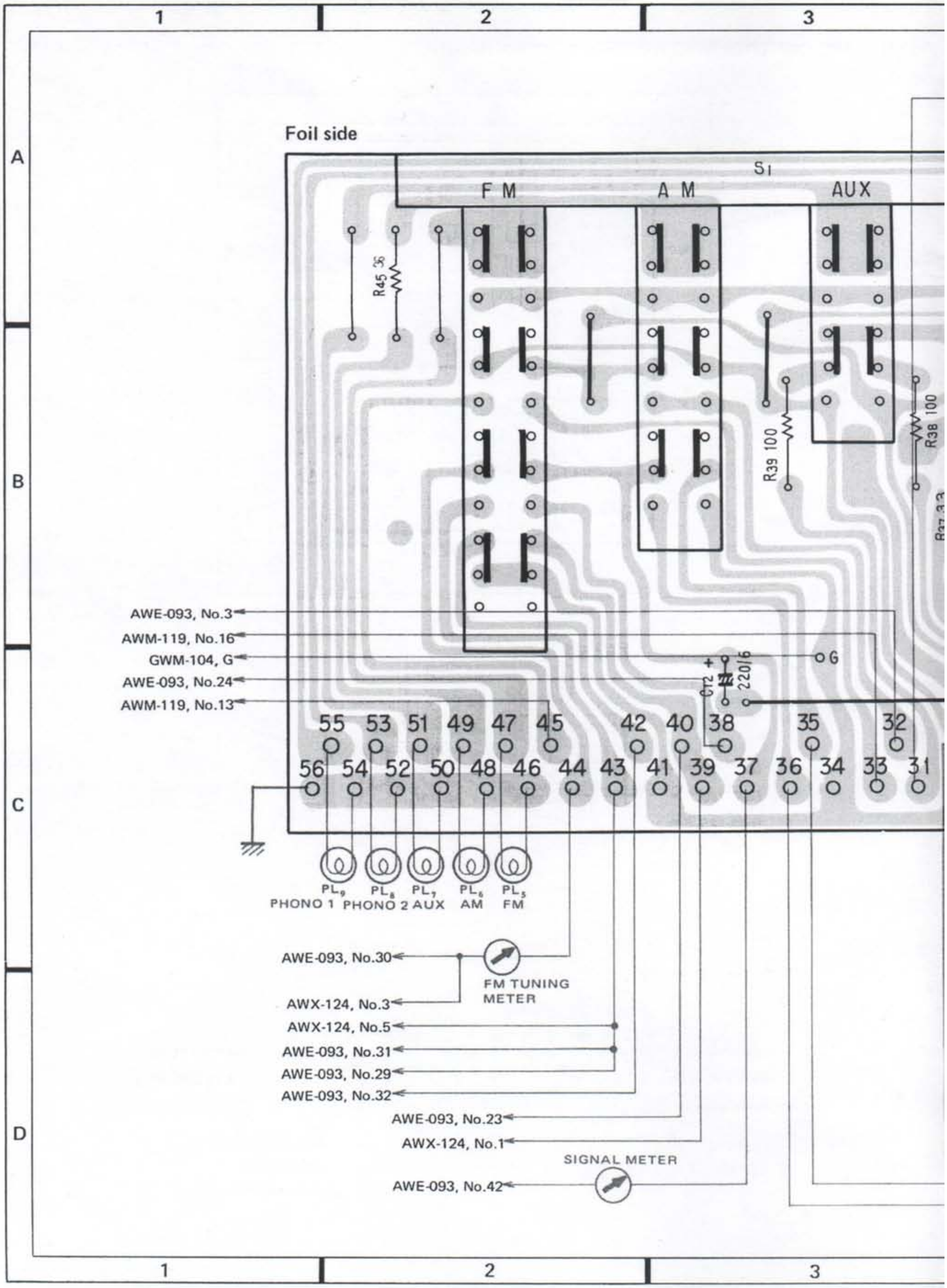
List of Changed Parts for Factory Modification

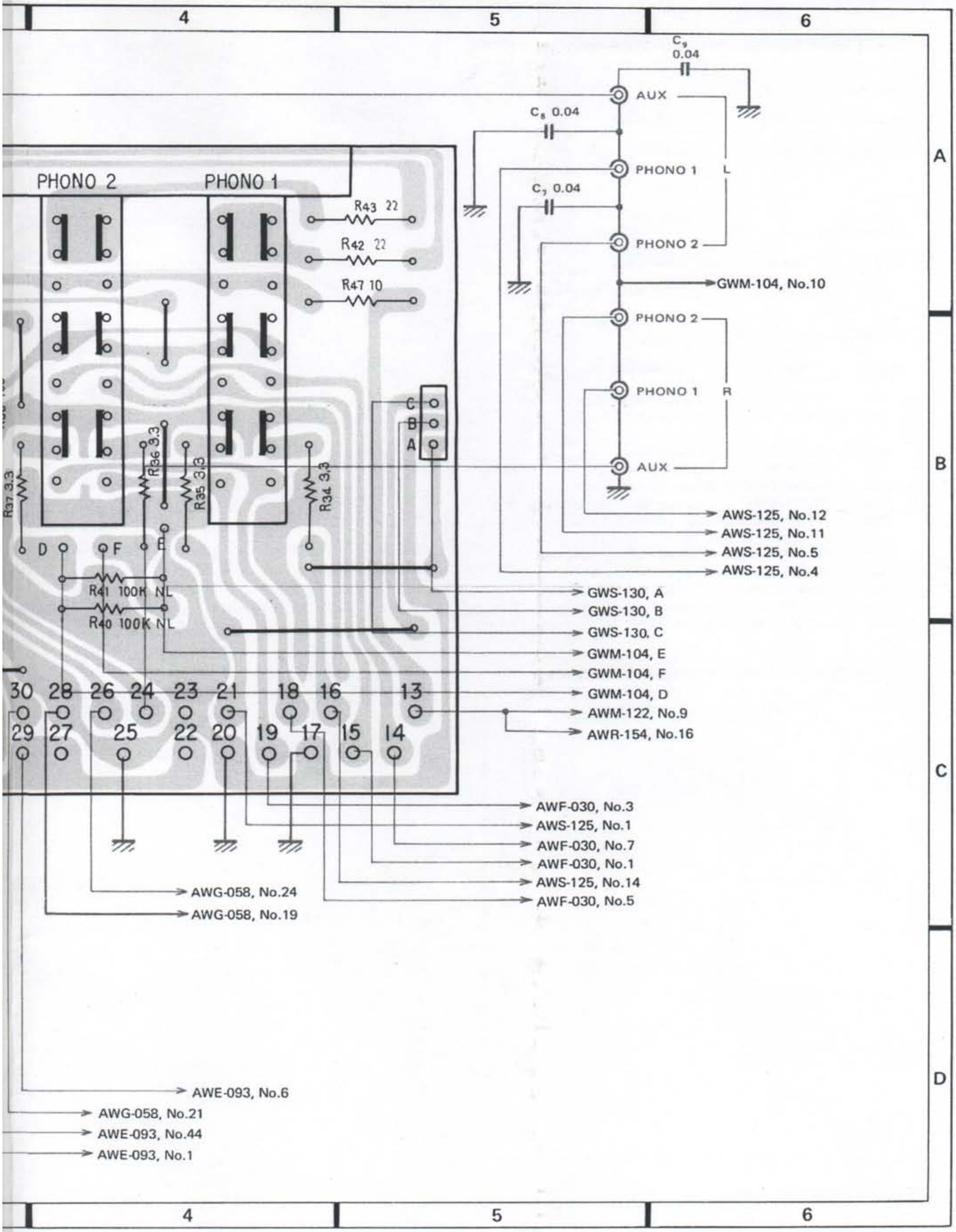
Symbol	Part No.	Description

12.8 FUNCTION SELECTOR ASSEMBLY (GWS-129)



F
G
J
E
C
B
A
56 GND
54
55 PHONO 1
R42 22
52
53 PHONO 2
R43 22
50
51 AUX
48
49 AM
R45 36
46
47 FM
FUNCTION
ON
OFF
R34 3.3
R35 3.3
R36 3.3
R37 3.3
R38 100
R39 100
R40 100K
R41 100K
C12 220/6
R47 10
18 EQ AMP IN R
16 PHONO 1 R
21 PHONO 1 L
14 EQ AMP OUT R
15 EQ AMP OUT L
19 EQ AMP IN L
17 GND
20
23
24 AUX R
26 R OUT
25
28
30 L OUT
31 AUX L
32 AM OUT
35 +B AM
34 +B 13.5V
36 FM S METER
37 S METER
38 AM S METER
39
40
22
13 +B 13.5V
45 FM OUT L
33 FM OUT R
44
43
42
41 +B 13.5V
29
27


1
2
3
A
B
C
D
Foil side
S1
FM
AM
AUX
R45 36
R39 100
R38 100
R37 3.3
C12 220/6
+
G
AWE-093, No.3
AWM-119, No.16
GWM-104, G
AWE-093, No.24
AWM-119, No.13
55
53
51
49
47
45
42
40
38
35
32
56
54
52
50
48
46
44
43
41
39
37
36
34
33
31
PL9
PHONO 1
PL8
PHONO 2
PL7
AUX
PL6
AM
PL5
FM
AWE-093, No.30
AWX-124, No.3
FM TUNING METER
AWX-124, No.5
AWE-093, No.31
AWE-093, No.29
AWE-093, No.32
AWE-093, No.23
AWX-124, No.1
SIGNAL METER
AWE-093, No.42


4
5
6
A
B
C
D
C9 0.04
AUX
C8 0.04
PHONO 1
L
C7 0.04
PHONO 2
GWM-104, No.10
PHONO 2
PHONO 1
R
AUX
PHONO 2
PHONO 1
R43 22
R42 22
R47 10
C
B
A
R37 3.3
R36 3.3
R35 3.3
R34 3.3
D
F
E
R41 100K NL
R40 100K NL
30
28
26
24
23
21
18
16
13
29
27
25
22
20
19
17
15
14
AWS-125, No.12
AWS-125, No.11
AWS-125, No.5
AWS-125, No.4
GWS-130, A
GWS-130, B
GWS-130, C
GWM-104, E
GWM-104, F
GWM-104, D
AWM-122, No.9
AWR-154, No.16
AWF-030, No.3
AWS-125, No.1
AWF-030, No.7
AWF-030, No.1
AWS-125, No.14
AWF-030, No.5
AWG-058, No.24
AWG-058, No.19
AWE-093, No.6
AWG-058, No.21
AWE-093, No.44
AWE-093, No.1

Parts List of Function Selector Assembly (GWS-129)

SWITCHES

Symbol	Part No.	Description
S1-5	ASG-126	Push switch (FM, AM, PHONO 2/MIC, PHONO 1)

CAPACITOR

Symbol	Part No.	Description		
C1	CEA 221P 6	Electrolytic	220	6V

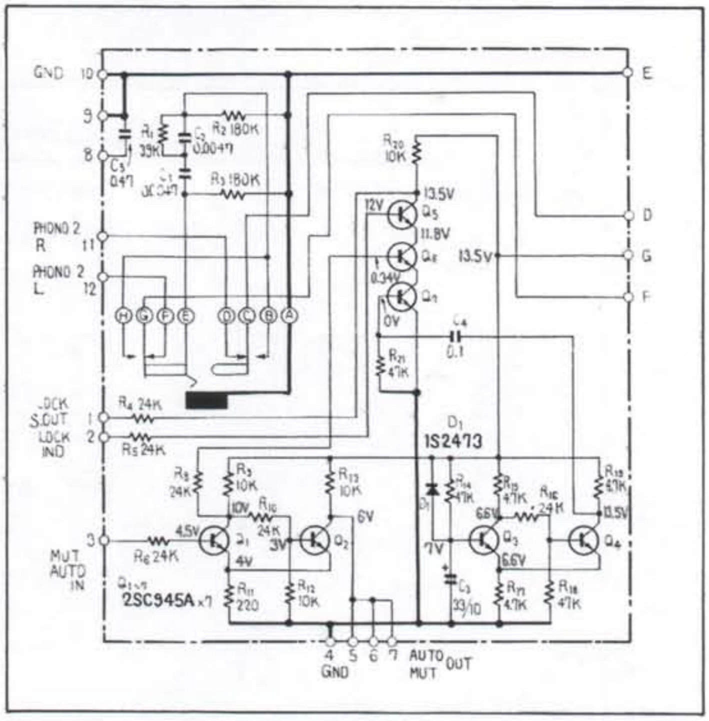
RESISTORS

Symbol	Part No.	Description	
R34	RD¼PS 3R3J	Carbon film	3.3
R35	RD¼PS 3R3J	Carbon film	3.3
R36	RD¼PS 3R3J	Carbon film	3.3
R37	RD¼PS 3R3J	Carbon film	3.3
R38	RD¼PS 101J	Carbon film	100
R39	RD¼PS 101J	Carbon film	100
R40	RD¼PS 104J NL	Carbon film	100k
R41	RD¼PS 104J NL	Carbon film	100k
R42	RD¼PS 220J	Carbon film	22
R43	RD¼PS 220J	Carbon film	22
R45	RD¼PS 360J	Carbon film	36
R47	RD¼PS 100J	Carbon film	10

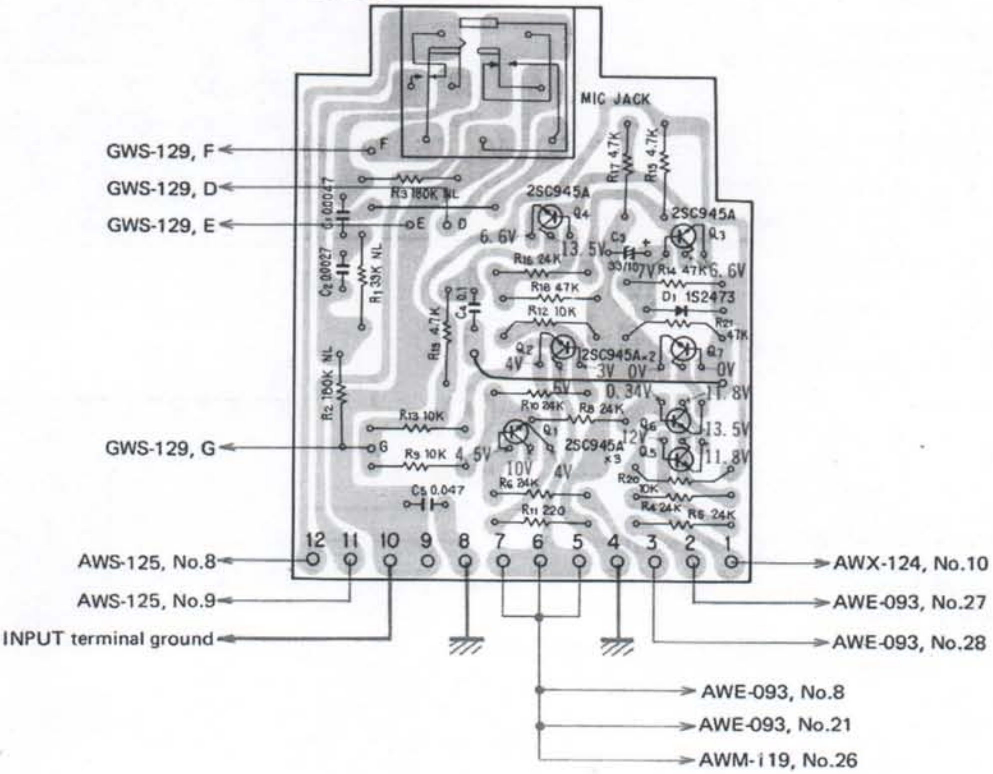
List of Changed Parts for Factory Modification

Symbol	Part No.	Description

12.9 APC CONTROL/MIC ASSEMBLY (GWM-104)


GND 10
9
8
C5 0.047
R1 33K
C2 0.0047
R2 180K
C1 0.0047
R3 180K
PHONO 2 R 11
PHONO 2 L 12
H G F E D C B A
LOCK S.OUT 1
LOCK IND 2
R4 24K
R5 24K
R20 10K
13.5V
12V
Q5
11.8V
Q6
13.5V
0.34V
Q7
0V
C4 0.1
R21 47K
D1 1S2473
R8 24K
R9 10K
R13 10K
10V
R10 24K
6V
4.5V
Q1
3V
Q2
4V
MUT AUTO IN 3
R6 24K
Q1~7 2SC945A×7
R11 220
R12 10K
R14 47K
R19 47K
R16 24K
R15 47K
13.5V
6.6V
7V
Q3
6.6V
Q4
C3 33/10
R17 4.7K
R18 47K
4 5 6 7
GND
AUTO MUT
OUT
E
D
G
F

Foil side


MIC JACK
GWS-129, F
GWS-129, D
GWS-129, E
GWS-129, G
R3 180K NL
C1 0.0047
C2 0.0027
R1 33K NL
R2 150K NL
R15 4.7K
C4 0.1
R17 4.7K
R19 4.7K
2SC945A
Q4
2SC945A
Q3
6.6V
13.5V
C3 33/10
7V
R14 47K
6.6V
R16 24K
R18 4.7K
R12 10K
D1 1S2473
R21 47K
Q2
4V
2SC945A×2
3V
0V
Q7
0V
0.34V
11.8V
R13 10K
R10 24K
R8 24K
Q1
2SC945A ×3
Q6
Q5
13.5V
11.8V
12V
R9 10K
4.5V
10V
4V
C5 0.047
R6 24K
R11 220
R20 10K
R4 24K
R5 24K
12 11 10 9 8 7 6 5 4 3 2 1
AWS-125, No.8
AWS-125, No.9
INPUT terminal ground
AWX-124, No.10
AWE-093, No.27
AWE-093, No.28
AWE-093, No.8
AWE-093, No.21
AWM-119, No.26

Parts List of APC Control/MIC Assembly (GWM-104)

CAPACITORS

Symbol	Part No.	Description		
C1	CQMA 472K 50	Mylar	0.0047	50V
C2	CQMA 272K 50	Mylar	0.0027	50V
C3	CSZA 330M 10	Electrolytic	33	10V
C4	CQMA 104K 50	Mylar	0.1	50V
C5	CKDYF 473Z 50	Ceramic	0.047	50V
	(CKDBC 473Z 25)			(25V)

RESISTORS

Symbol	Part No.	Description	
R1	RD¼PS 393J NL	Carbon film	39k
R2	RD¼PS 184J NL	Carbon film	180k
R3	RD¼PS 184J NL	Carbon film	180k
R4	RD¼PS 243J	Carbon film	24k
R5	RD¼PS 243J	Carbon film	24k
R6	RD¼PS 243J	Carbon film	24k
R8	RD¼PS 243J	Carbon film	24k
R9	RD¼PS 103J	Carbon film	10k
R10	RD¼PS 243J	Carbon film	24k
R11	RD¼PS 221J	Carbon film	220
R12	RD¼PS 103J	Carbon film	10k
R13	RD¼PS 103J	Carbon film	10k
R14	RD¼PS 473J	Carbon film	47k
R15	RD¼PS 472J	Carbon film	4.7k
R16	RD¼PS 243J	Carbon film	24k
R17	RD¼PS 472J	Carbon film	4.7k
R18	RD¼PS 473J	Carbon film	47k
R19	RD¼PS 472J	Carbon film	4.7k
R20	RD¼PS 103J	Carbon film	10k
R21	RD¼PS 473J	Carbon film	47k
R42	RD¼PS 100J	Carbon film	10
R43	RD¼PS 100J	Carbon film	10
R44	RD¼PS 100J	Carbon film	10
R45	RD¼PS 100J	Carbon film	10
R46	RD¼PS 100J	Carbon film	10
R47	RD¼PS 100J	Carbon film	10

SEMICONDUCTORS

Symbol	Part No.	Description
Q1	2SC945A-Q or R	Transistor
Q2	2SC945A-Q or R	Transistor
Q3	2SC945A-Q or R	Transistor
Q4	2SC945A-Q or R	Transistor
Q5	2SC945A-Q or R	Transistor
Q6	2SC945A-Q or R	Transistor
Q7	2SC945A-Q or R	Transistor
D1	1S2473	Diode

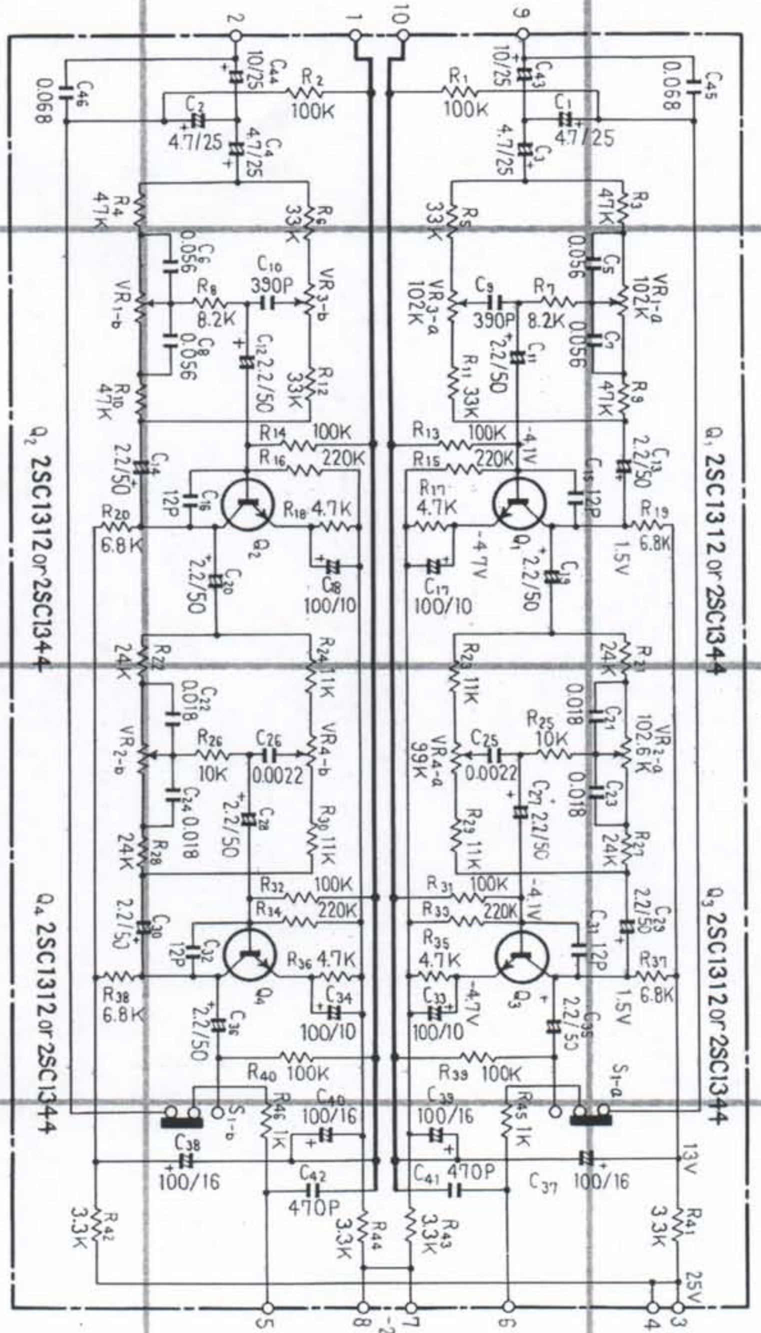
OTHER

Symbol	Part No.	Description
	AKN-012	Phone jack (MIC)

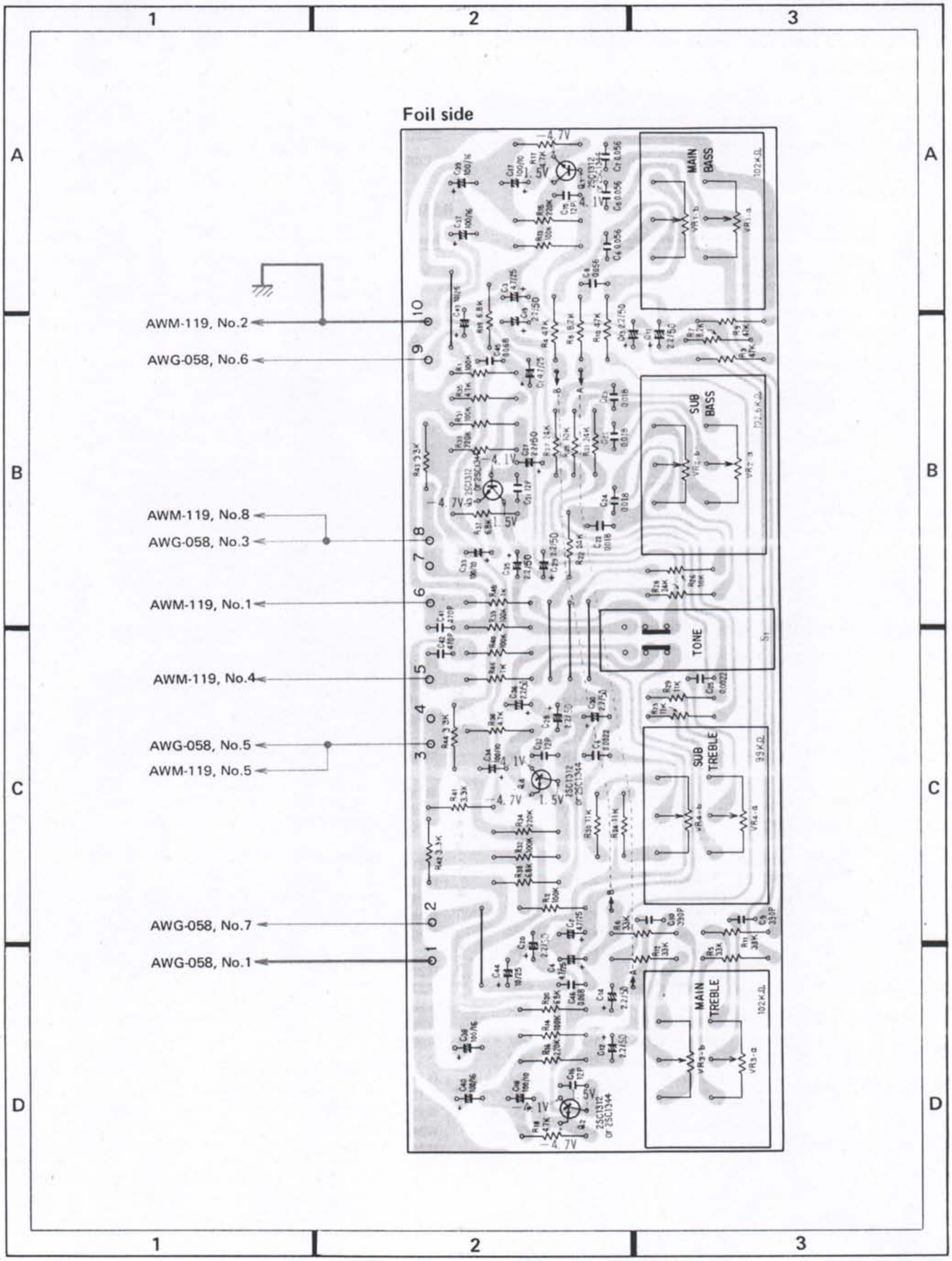
List of Changed Parts for Factory Modification

Symbol	Part No.	Description

12.11 TONE CONTROL ASSEMBLY (AWG-059)


1
2
3
A
B
C
D
2
1
10
9
C46 0.068
C44 10/25
R2 100K
C2 4.7/25
C4 4.7/25
R4 47K
R6 33K
C6 0.056
VR1-b
R8 8.2K
C10 390P
VR3-b
C8 0.056
C12 2.2/50
R10 47K
R12 33K
R14 100K
R16 220K
C14 2.2/50
C16 12P
R18 4.7K
R20 6.8K
Q2
C20 2.2/50
C18 100/10
Q2 2SC1312 or 2SC1344
R22 24K
R24 11K
C22 0.018
VR2-b
R26 10K
C26 0.0022
VR4-b
C24 0.018
C28 2.2/50
R28 24K
R30 11K
R32 100K
R34 220K
C30 2.2/50
C32 12P
R36 4.7K
Q4
R38 6.8K
C34 100/10
C36 2.2/50
R40 100K
Q4 2SC1312 or 2SC1344
S1-b
R46 1K
C40 100/16
C38 100/16
C42 470P
R42 3.3K
R44 3.3K
R1 100K
C43 10/25
C45 0.068
C1 4.7/25
C3 4.7/25
R3 47K
R5 33K
C5 0.056
VR1-a 102K
VR3-a 102K
C9 390P
R7 8.2K
C7 0.056
C11 2.2/50
R11 33K
R9 47K
R13 100K
R15 220K
-4.1V
C13 2.2/50
C15 12P
R17 4.7K
R19 6.8K
-4.7V
Q1
C19 2.2/50
1.5V
C17 100/10
Q1 2SC1312 or 2SC1344
R23 11K
R21 24K
C21 0.018
VR2-a 102.6K
VR4-a 99K
C25 0.0022
R25 10K
C23 0.018
C27 2.2/50
R29 11K
R27 24K
R31 100K
R33 220K
-4.1V
C29 2.2/50
R35 4.7K
C31 12P
R37 6.8K
C33 100/10
-4.7V
Q3
1.5V
C35 2.2/50
R39 100K
Q3 2SC1312 or 2SC1344
S1-a
C39 100/16
R45 1K
C41 470P
C37 100/16
13V
R43 3.3K
R41 3.3K
25V
5
8
-25V
7
6
4
3
1
2
3

Foil side


1
2
3
A
B
C
D
AWM-119, No.2
AWG-058, No.6
AWM-119, No.8
AWG-058, No.3
AWM-119, No.1
AWM-119, No.4
AWG-058, No.5
AWM-119, No.5
AWG-058, No.7
AWG-058, No.1
10
9
8
7
6
5
4
3
2
1
MAIN BASS
VR1-b
VR1-a
102KΩ
SUB BASS
VR2-b
VR2-a
102.5KΩ
TONE
S1
SUB TREBLE
VR4-b
VR4-a
99KΩ
MAIN TREBLE
VR3-b
VR3-a
102KΩ
-4.7V
5V
1V
-4.1V
1.5V
2SC1312 or 2SC1344

Parts List of Tone Control Assembly (AWG-059)

SWITCH

Symbol	Part No.	Description
S1	ASK-144	Lever switch (TONE)

CAPACITORS

Symbol	Part No.	Description		
C1	CSZA 4R7M 25	Electrolytic	4.7	25V
C2	CSZA 4R7M 25	Electrolytic	4.7	25V
C3	CSZA 4R7M 25	Electrolytic	4.7	25V
C4	CSZA 4R7M 25	Electrolytic	4.7	25V
C5	CQMA 563J 50	Mylar	0.056	50V
C6	CQMA 563J 50	Mylar	0.056	50V
C7	CQMA 563J 50	Mylar	0.056	50V
C8	CQMA 563J 50	Mylar	0.056	50V
C9	CQSA 391J 50	Polystyrene	390p	50V
C10	CQSA 391J 50	Polystyrene	390p	50V
C11	CEANL 2R2P 50	Electrolytic	2.2	50V
C12	CEANL 2R2P 50	Electrolytic	2.2	50V
C13	CEANL 2R2P 50	Electrolytic	2.2	50V
C14	CEANL 2R2P 50	Electrolytic	2.2	50V
C15	CCDSL 120K 50	Ceramic	12p	50V
C16	CCDSL 120K 50	Ceramic	12p	50V
C17	ACH-312	Electrolytic	100	10V
C18	ACH-312	Electrolytic	100	10V
C19	CEANL 2R2P 50	Electrolytic	2.2	50V
C20	CEANL 2R2P 50	Electrolytic	2.2	50V
C21	CQMA 183J 50	Mylar	0.018	50V
C22	CQMA 183J 50	Mylar	0.018	50V
C23	CQMA 183J 50	Mylar	0.018	50V
C24	CQMA 183J 50	Mylar	0.018	50V
C25	CKDYA 222J 50	Ceramic	2200p	50V
C26	CKDYA 222J 50	Ceramic	2200p	50V
C27	CEANL 2R2P 50	Electrolytic	2.2	50V
C28	CEANL 2R2P 50	Electrolytic	2.2	50V
C29	CEANL 2R2P 50	Electrolytic	2.2	50V
C30	CEANL 2R2P 50	Electrolytic	2.2	50V
C31	CCDSL 120K 50	Ceramic	12p	50V
C32	CCDSL 120K 50	Ceramic	12p	50V
C33	ACH-312	Electrolytic	100	10V
C34	ACH-312	Electrolytic	100	10V
C35	CEANL 2R2P 50	Electrolytic	2.2	50V
C36	CEANL 2R2P 50	Electrolytic	2.2	50V
C37	ACH-311	Electrolytic	100	16V
C38	ACH-311	Electrolytic	100	16V
C39	ACH-311	Electrolytic	100	16V
C40	ACH-311	Electrolytic	100	16V
C41	CKDYB 471K 50	Ceramic	470p	50V
C42	CKDYB 471K 50	Ceramic	470p	50V
C43	CSZA 100M 25	Electrolytic	10	25V
C44	CSZA 100M 25	Electrolytic	10	25V
C45	CQMA 683J 50	Mylar	0.068	50V
C46	CQMA 683J 50	Mylar	0.068	50V

RESISTORS

Symbol	Part No.	Description	
VR1	ACW-101 (ACV-165)	Variable resistor (BASS 50Hz)	
VR2	ACW-102 (ACV-166)	Variable resistor (BASS 100Hz)	
VR3	ACW-104 (ACV-168)	Variable resistor (TREABLE 20kHz)	
VR4	ACW-103 (ACV-167)	Variable resistor (TREABLE 10kHz)	
R1	RD¼PS 104J	Carbon film	100k
R2	RD¼PS 104J	Carbon film	100k
R3	RD¼PS 473J	Carbon film	47k
R4	RD¼PS 473J	Carbon film	47k
R5	RD¼PS 333J	Carbon film	33k
R6	RD¼PS 333J	Carbon film	33k
R7	RD¼PS 822J	Carbon film	8.2k
R8	RD¼PS 822J	Carbon film	8.2k
R9	RD¼PS 473J	Carbon film	47k
R10	RD¼PS 473J	Carbon film	47k
R11	RD¼PS 333J	Carbon film	33k
R12	RD¼PS 333J	Carbon film	33k
R13	RD¼PS 104J NL	Carbon film	100k
R14	RD¼PS 104J NL	Carbon film	100k
R15	RD¼PS 224J NL	Carbon film	220k
R16	RD¼PS 224J NL	Carbon film	220k
R17	RD¼PS 472J	Carbon film	4.7k
R18	RD¼PS 472J	Carbon film	4.7k
R19	RD¼PS 682J	Carbon film	6.8k
R20	RD¼PS 682J	Carbon film	6.8k
R21	RD¼PS 243J	Carbon film	24k
R22	RD¼PS 243J	Carbon film	24k
R23	RD¼PS 113J	Carbon film	11k
R24	RD¼PS 113J	Carbon film	11k
R25	RD¼PS 103J	Carbon film	10k
R26	RD¼PS 103J	Carbon film	10k
R27	RD¼PS 243J	Carbon film	24k
R28	RD¼PS 243J	Carbon film	24k
R29	RD¼PS 113J	Carbon film	11k
R30	RD¼PS 113J	Carbon film	11k
R31	RD¼PS 104J NL	Carbon film	100k
R32	RD¼PS 104J NL	Carbon film	100k
R33	RD¼PS 224J NL	Carbon film	220k
R34	RD¼PS 224J NL	Carbon film	220k
R35	RD¼PS 472J	Carbon film	4.7k
R36	RD¼PS 472J	Carbon film	4.7k
R37	RD¼PS 682J	Carbon film	6.8k

Symbol	Part No.	Description	
R38	RD¼PS 682J	Carbon film	6.8k
R39	RD¼PS 104J	Carbon film	100k
R40	RD¼PS 104J	Carbon film	100k
R41	RD¼PS 332J	Carbon film	3.3k
R42	RD¼PS 332J	Carbon film	3.3k
R43	RD¼PS 332J	Carbon film	3.3k
R44	RD¼PS 332J	Carbon film	3.3k
R45	RD¼PS 102J	Carbon film	1k
R46	RD¼PS 102J	Carbon film	1k

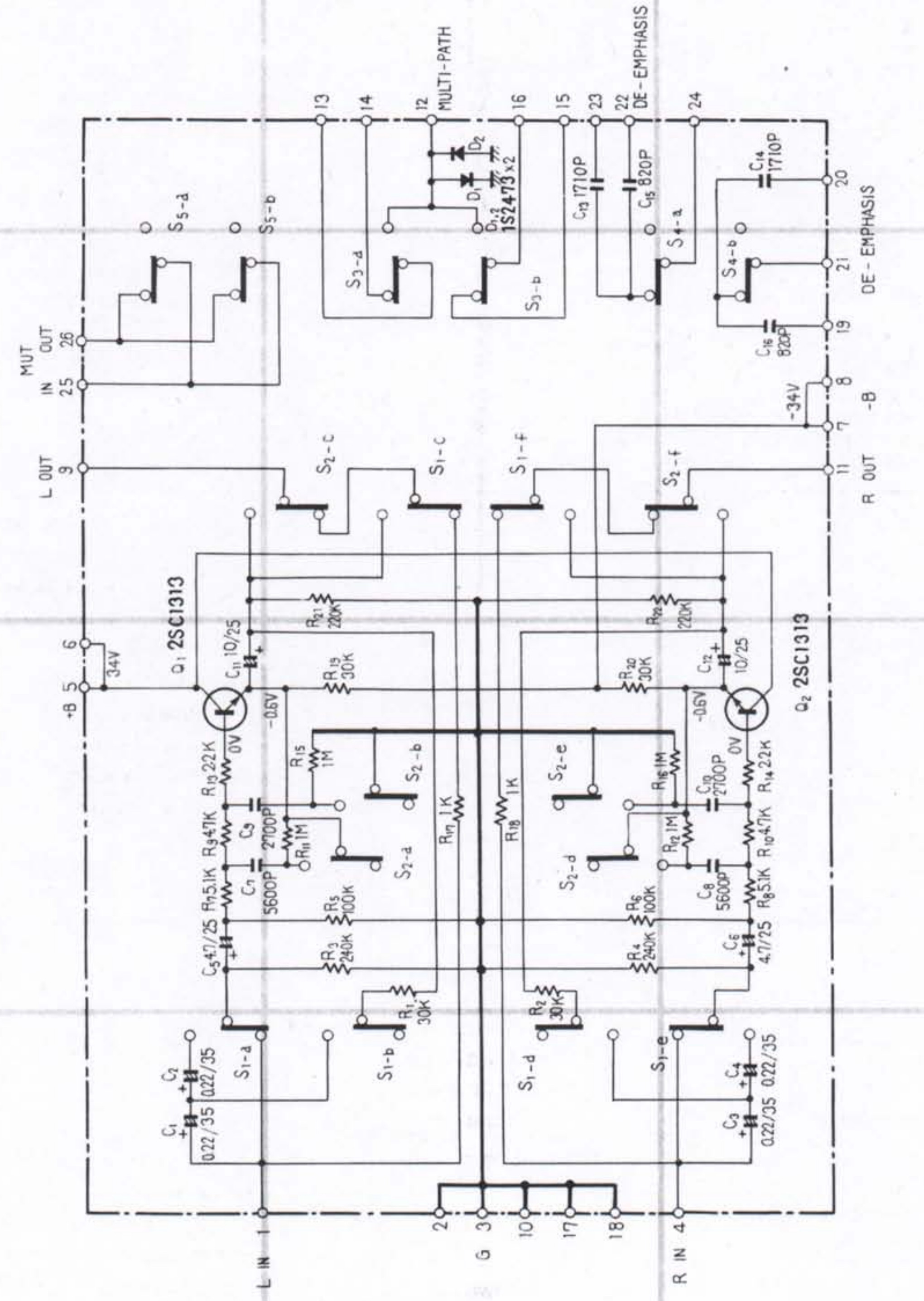
SEMICONDUCTORS

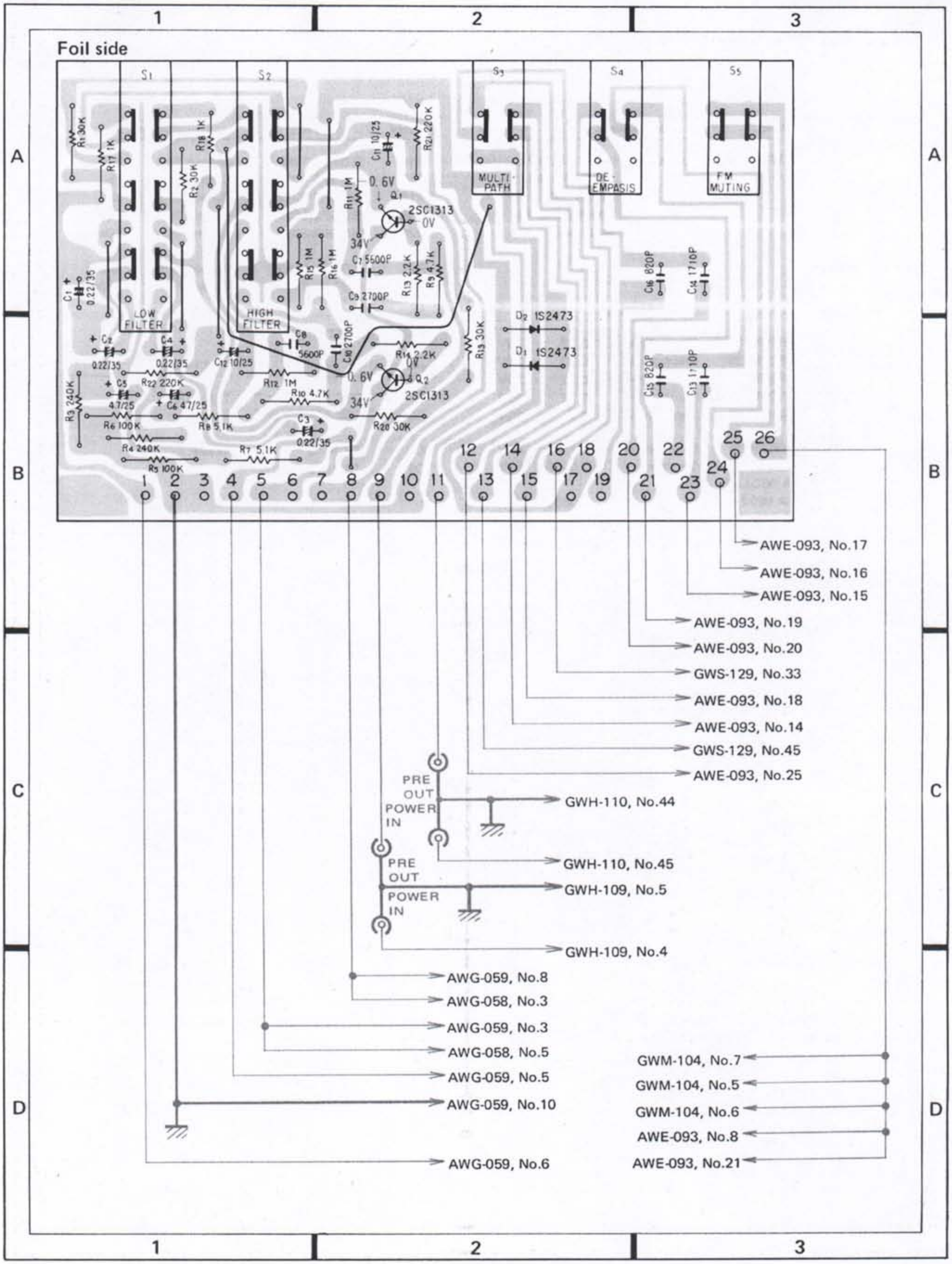
Symbol	Part No.	Description
Q1	2SC 1312-G or H (2SC 1344-E or F)	Transistor
Q2	2SC 1312-G or H (2SC 1344-E or F)	Transistor
Q3	2SC 1312-G or H (2SC 1344-E or F)	Transistor
Q4	2SC 1312-G or H (2SC 1344-E or F)	Transistor

List of Changed Parts for Factory Modification

Symbol	Part No.	Description

12.12 FILTER ASSEMBLY (AWM-119)


MULTI-PATH
DE-EMPHASIS
13
14
12
16
15
23
22
24
20
21
19
8
7
11
D1
D2
D1,2 1S2473×2
C13 1710P
C15 820P
C14 1710P
C16 820P
S5-a
S5-b
S3-a
S3-b
S4-a
S4-b
MUT IN 25
MUT OUT 26
-34V
-B
L OUT 9
R OUT
S2-c
S1-c
S1-f
S2-f
Q1 2SC1313
Q2 2SC1313
C11 10/25
C12 10/25
R21 220K
R22 220K
R19 30K
R20 30K
+B 5
6
34V
-0.6V
0V
R13 22K
R14 22K
R15 1M
R16 1M
S2-b
S2-e
C9 2700P
C10 2700P
R11 1M
R12 1M
R9 4.7K
R10 4.7K
S2-a
S2-d
R17 1K
R18 1K
R7 5.1K
R8 5.1K
C7 5600P
C8 5600P
R5 100K
R6 100K
C5 4.7/25
C6 4.7/25
R3 240K
R4 240K
R1 30K
R2 30K
S1-a
S1-b
S1-d
S1-e
C1 0.22/35
C2 0.22/35
C3 0.22/35
C4 0.22/35
L IN 1
2
G 3
10
17
18
R IN 4
1
2
3
A
B
C
D


Foil side
S1
S2
S3
S4
S5
LOW FILTER
HIGH FILTER
MULTI-PATH
DE-EMPASIS
FM MUTING
R1 30K
R17 1K
R2 30K
R18 1K
C1 0.22/35
C2 0.22/35
C4 0.22/35
C5 47/25
C6 47/25
C12 10/25
C8 5600P
C10 2700P
C11 10/25
R21 220K
R11 1M
0.6V
Q1
2SC1313
0V
34V
R15 1M
R16 1M
C7 5600P
C9 2700P
R13 2.2K
R9 4.7K
R14 2.2K
Q2
2SC1313
R19 30K
D2 1S2473
D1 1S2473
C16 820P
C14 1710P
C15 820P
C13 1710P
R3 240K
R22 220K
R6 100K
R8 5.1K
R4 240K
R5 100K
R7 5.1K
R12 1M
R10 4.7K
R20 30K
C3 0.22/35
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26
AWE-093, No.17
AWE-093, No.16
AWE-093, No.15
AWE-093, No.19
AWE-093, No.20
GWS-129, No.33
AWE-093, No.18
AWE-093, No.14
GWS-129, No.45
AWE-093, No.25
PRE OUT
POWER IN
GWH-110, No.44
GWH-110, No.45
PRE OUT
POWER IN
GWH-109, No.5
GWH-109, No.4
AWG-059, No.8
AWG-058, No.3
AWG-059, No.3
AWG-058, No.5
AWG-059, No.5
AWG-059, No.10
AWG-059, No.6
GWM-104, No.7
GWM-104, No.5
GWM-104, No.6
AWE-093, No.8
AWE-093, No.21
A
B
C
D
1
2
3

Parts List of Filter Assembly (AWM-119)

SWITCHES

Symbol	Part No.	Description
S1~S5	ASG-127	Push switch (LOW FILTER, HIGH FILTER, MULTI-PATH, DE-EMPHASIS, FM MUTING)

CAPACITORS

Symbol	Part No.	Description		
C1	CSZA R22M 35	Electrolytic	0.22	35V
C2	CSZA R22M 35	Electrolytic	0.22	35V
C3	CSZA R22M 35	Electrolytic	0.22	35V
C4	CSZA R22M 35	Electrolytic	0.22	35V
C5	CSZA 4R7M 25	Electrolytic	4.7	25V
C6	CSZA 4R7M 25	Electrolytic	4.7	25V
C7	CKDYA 562J 50 (CQMA 562J 50)	Ceramic (Mylar)	0.0056	50V
C8	CKDYA 562J 50 (CQMA 562J 50)	Ceramic (Mylar)	0.0056	50V
C9	CKDYA 272J 50 (CQMA 272J 50)	Ceramic (Mylar)	0.0027	50V
C10	CKDYA 272J 50 (CQMA 272J 50)	Ceramic (Mylar)	0.0027	50V
C11	CSZA 100M 25	Electrolytic	10	25V
C12	CSZA 100M 25	Electrolytic	10	25V
C13	ACE-043	Polystyrene	1710p	50V
C14	ACE-043	Polystyrene	1710p	50V
C15	CQSA 821G 50	Polystyrene	820p	50V
C16	CQSA 821G 50	Polystyrene	820p	50V

RESISTORS

Symbol	Part No.	Description	
R1	RD¼PS 303J	Carbon film	30k
R2	RD¼PS 303J	Carbon film	30k
R3	RD¼PS 244J NL	Carbon film	240k
R4	RD¼PS 244J NL	Carbon film	240k
R5	RD¼PS 104J NL	Carbon film	100k
R6	RD¼PS 104J NL	Carbon film	100k
R7	RD¼PS 512J	Carbon film	5.1k
R8	RD¼PS 512J	Carbon film	5.1k
R9	RD¼PS 472J	Carbon film	4.7k
R10	RD¼PS 472J	Carbon film	4.7k
R11	RD¼PS 105J	Carbon film	1M
R12	RD¼PS 105J	Carbon film	1M
R13	RD¼PS 222J	Carbon film	2.2k
R14	RD¼PS 222J	Carbon film	2.2k
R15	RD¼PS 105J	Carbon film	1M
R16	RD¼PS 105J	Carbon film	1M
R17	RD¼PS 102J	Carbon film	1k
R18	RD¼PS 102J	Carbon film	1k
R19	RD¼PS 303J	Carbon film	30k
R20	RD¼PS 303J	Carbon film	30k
R21	RD¼PS 224J	Carbon film	220k
R22	RD¼PS 224J	Carbon film	220k

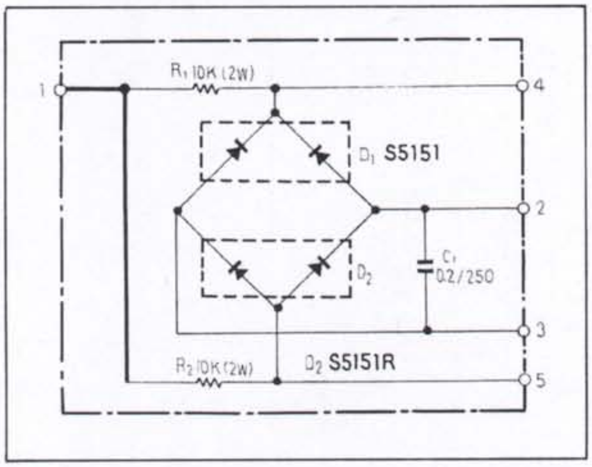
SEMICONDUCTORS

Symbol	Part No.	Description
Q1	2SC 1313-G or F	Transistor
Q2	2SC 1313-G or F	Transistor
D1	1S 2473	Diode
D2	1S 2473	Diode

List of Changed Parts for Factory Modification

Symbol	Part No.	Description

12.13 RECTIFIER L ASSEMBLY (GWR-106)


R1 10K (2W)
D1 S5151
C1
0.2/250
D2
R2 10K (2W)
D2 S5151R
1
2
3
4
5

Parts List

CAPACITOR

Symbol	Part No.	Description		
C1	CQMA 204J 250	Mylar	0.2	250V

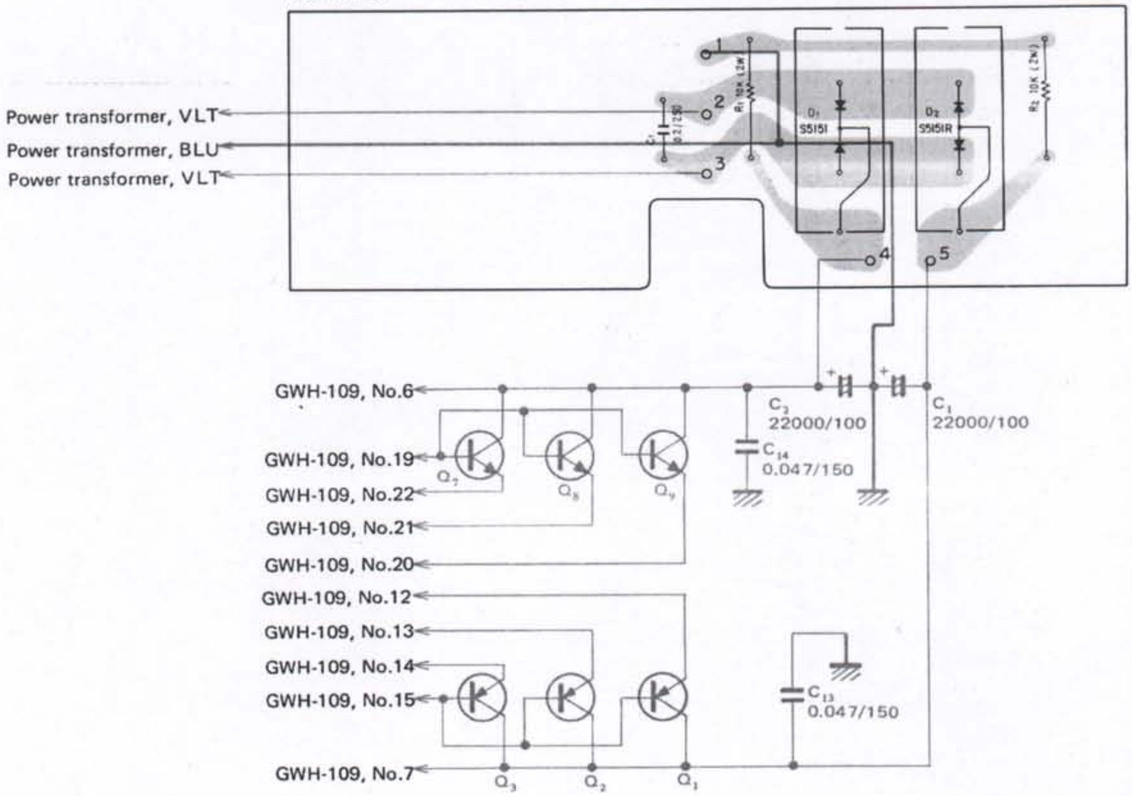
RESISTORS

Symbol	Part No.	Description		
R1	RS2P 103J	Metal oxide	10k	2W
R2	RS2P 103J	Metal oxide	10k	2W

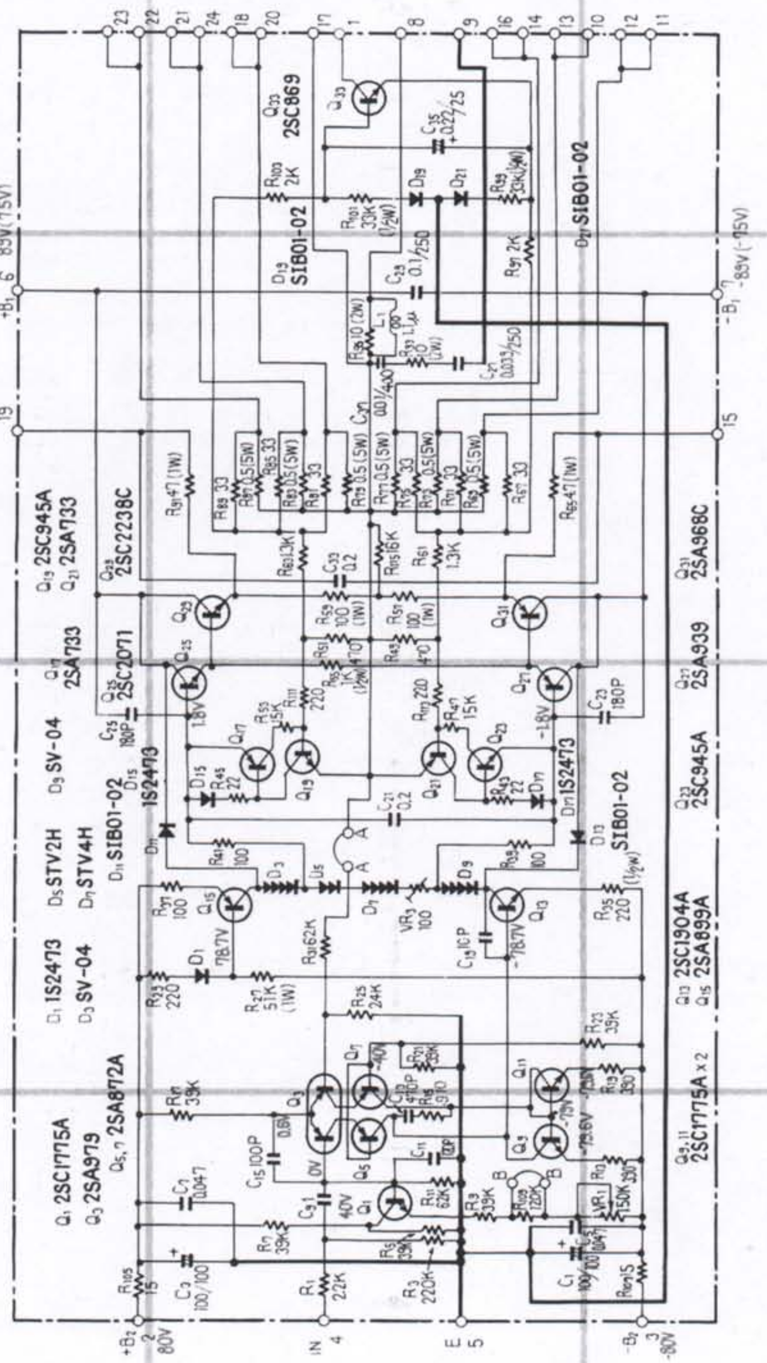
SEMICONDUCTORS

Symbol	Part No.	Description
D1	S5151	Diode
D2	S5151R	Diode

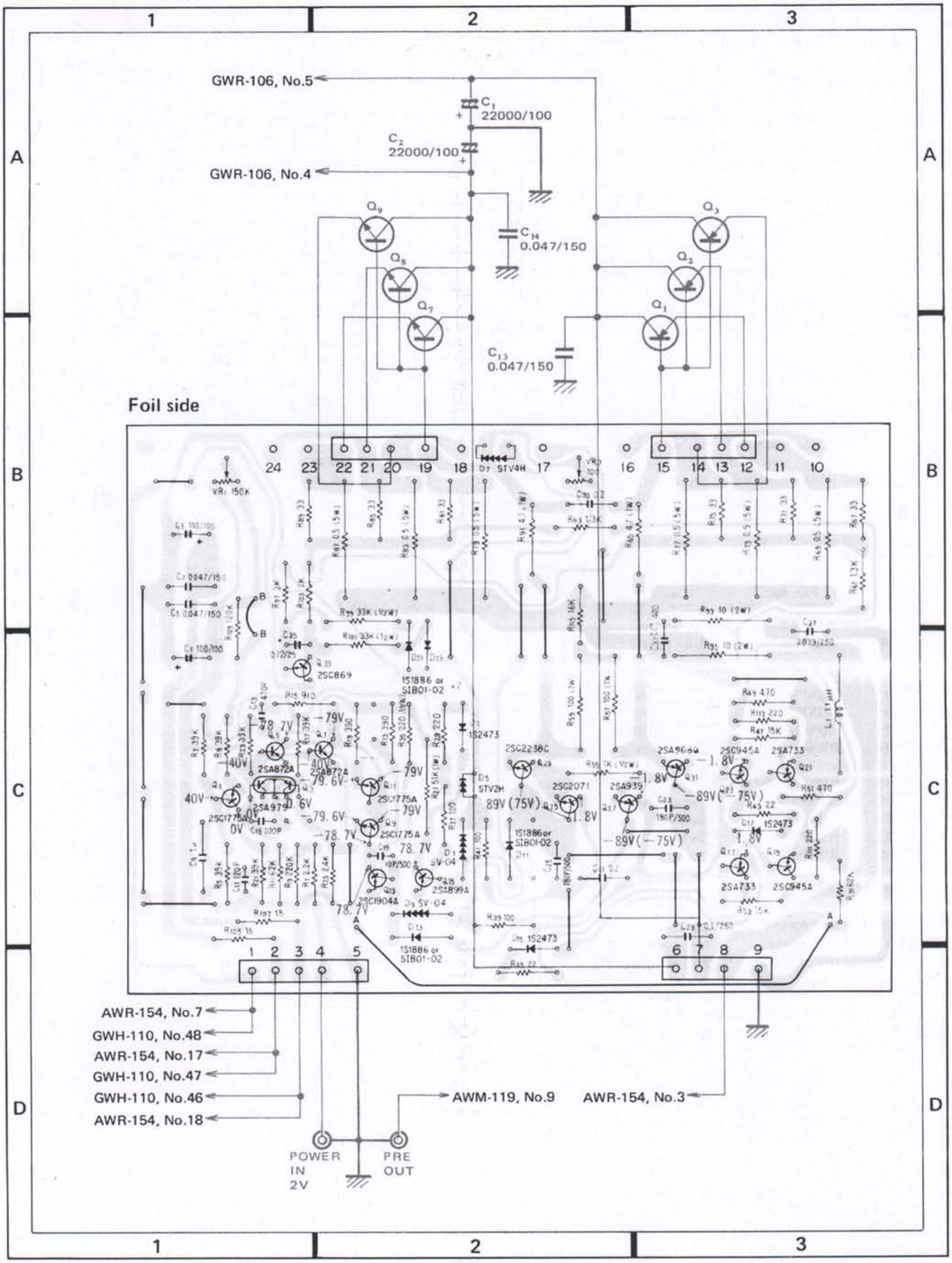
Foil side


Power transformer, VLT
Power transformer, BLU
Power transformer, VLT
1
2
3
4
5
C1 0.2/250
R1 10K (2W)
D1 S5151
D2 S5151R
R2 10K (2W)
GWH-109, No.6
GWH-109, No.19
GWH-109, No.22
GWH-109, No.21
GWH-109, No.20
GWH-109, No.12
GWH-109, No.13
GWH-109, No.14
GWH-109, No.15
GWH-109, No.7
Q7
Q8
Q9
Q3
Q2
Q1
C2 22000/100
C1 22000/100
C14 0.047/150
C13 0.047/150

12.14 POWER AMPLIFIER L ASSEMBLY (GWH-109)



1
2
3
A
B
C
D
Q1 2SC1775A
Q3 2SA979
Q5, 7 2SA872A
D1 1S2473
D3 SV-04
D5 STV2H
D7 STV4H
D11 SIB01-02
D9 SV-04
D15 1S2473
Q17 2SA733
Q25 2SC2071
Q19 2SC945A
Q21 2SA733
Q29 2SC2238C
Q33 2SC869
D13 SIB01-02
D21 SIB01-02
Q31 2SA968C
Q27 2SA939
Q23 2SC945A
D17 1S2473
D13 SIB01-02
Q13 2SC1904A
Q15 2SA899A
Q9, 11 2SC1775A x 2
+B1 6 89V (75V)
-B1 7 -89V (-75V)
+B2 2 80V
-B2 3 -80V
IN 4
E 5
19
15
23
22
21
24
18
20
17
1
8
9
16
14
13
10
12
11
R105 15
C3 100/100
C7 0.047
R7 39K
R1 2.2K
R3 220K
R5 39K
R11 62K
R9 39K
R107 120K
R13 150K
VR1 100K
C1 100/100
C5 1 (0.47)
R103 15
C9 1
C15 100P
C11 100P
C13 470P
R15 910
R21 39K
R17 39K
R19 330
R23 39K
R25 24K
R31 62K
R27 51K (1W)
R29 220
R37 100
C19 10P
VR3 100
R35 220
R41 100
R39 100
C21 0.2
R45 22
R43 22
R53 15K
R47 15K
R111 220
R113 220
C25 180P
C23 180P
R63 1K (1/2W)
R61 1K
R59 100 (1W)
R57 100 (1W)
R55 470
R49 470
C33 0.2
R83 1.3K
R81 1.3K
R91 47 (1W)
R65 47 (1W)
R89 33
R87 0.5 (5W)
R85 33
R79 0.5 (5W)
R73 0.5 (5W)
R71 0.5 (5W)
R75 33
R69 0.5 (5W)
R77 33
R67 33
R95 16K
C37 0.01/400
R99 10 (2W)
L1 1μ
R97 10 (2W)
C27 0.033/250
C29 0.1/250
R101 33K (1/2W)
R103 2K
R93 2K
R99 33K (1/2W)
C35 0.22/25
0V
0.6V
40V
-40V
-79V
-79.6V
78.7V
-78.7V
1.8V
-1.8V
A
B


1
2
3
A
B
C
D
GWR-106, No.5
GWR-106, No.4
C1 22000/100
C2 22000/100
C14 0.047/150
C13 0.047/150
Q9
Q8
Q7
Q3
Q2
Q1
Foil side
24
23
22
21
20
19
18
D7 STV4H
17
16
15
14
13
12
11
10
VR1 150K
VR3 100
2SC869
2SA872A
2SA979
2SC1775A
2SC1904A
2SA899A
2SC2238C
2SC2071
2SA939
2SA968B
2SC945A
2SA733
STV2H
1S1886 or SIB01-02
1S2473
SV-04
L1 1.1µH
40V
0V
-79V
-79.6V
-78.7V
78.7V
89V (75V)
-89V (-75V)
1.8V
-1.8V
1
2
3
4
5
6
7
8
9
AWR-154, No.7
GWH-110, No.48
AWR-154, No.17
GWH-110, No.47
GWH-110, No.46
AWR-154, No.18
AWM-119, No.9
AWR-154, No.3
POWER IN 2V
PRE OUT

Parts List of Power Amplifier L Assembly (GWH-109)

CAPACITORS

Symbol	Part No.	Description		
C1	CEA 101P 100	Electrolytic	100	100V
C3	CEA 101P 100	Electrolytic	100	100V
C5	ACG-009	Ceramic	0.047	150V
C7	ACG-009	Ceramic	0.047	150V
C9	ACE-008	Metallized mylar	1	100V
C11	CCDSL 121K 50	Ceramic	120p	50V
C13	CCDSL 471K 50	Ceramic	470p	50V
C15	CCDSL 101K 50	Ceramic	100p	50V
C17				
C19	CCDSL 100K 500	Ceramic	10p	500V
C21	CQMA 204K 50	Mylar	0.2	50V
C23	CCDSL 181K 500	Ceramic	180p	500V
C25	CCDSL 181K 500	Ceramic	180p	500V
C27	CQMA 393K 250	Mylar	0.039	250V
C29	CQMA 104K 250	Mylar	0.1	250V
C33	CQMA 204K 50	Mylar	0.2	50V
C35	CSSA R22M 25	Electrolytic	0.22	25V
C37	CQMA 103K 40	Mylar	0.01	400V

RESISTORS

Symbol	Part No.	Description		
VR1	ACP-063	Semi-fixed	(150k-B)	
VR3	ACP-032	Semi-fixed	(100-B)	
R1	RD¼PS 222J	Carbon film	2.2k	
R3	RD¼PS 224J NL	Carbon film	220k	
R5	RD¼PS 393J NL	Carbon film	39k	
R7	RD¼PS 393J NL	Carbon film	39k	
R9	RD¼PS 393J NL	Carbon film	39k	
R11	RD¼PS 623J NL	Carbon film	62k	
R13	RD¼PS 391J	Carbon film	390	
R15	RD¼PS 911J	Carbon film	910	
R17	RD¼PS 393J NL	Carbon film	39k	
R19	RD¼PS 391J	Carbon film	390	
R21	RD¼PS 393J NL	Carbon film	39k	
R23	RD¼PS 393J NL	Carbon film	39k	
R25	RD¼PS 242J	Carbon film	2.4k	
R27	RS1P 513J	Metal oxide	51k	1W
R29	RD¼PSF 221J	Carbon film	220	
R31	RD¼PS 623J NL	Carbon film	62k	
R35	RD½PSF 221J	Carbon film	220	½W
R37	RD¼PSF 101J	Carbon film	100	
R39	RD¼PSF 101J	Carbon film	100	
R41	RD¼PSF 101J	Carbon film	100	
R43	RD¼PSF 220J	Carbon film	22	
R45	RD¼PSF 220J	Carbon film	22	
R47	RD¼PS 153J	Carbon film	15k	
R49	RD¼PSF 471J	Carbon film	470	
R51	RD¼PSF 471J	Carbon film	470	
R53	RD¼PS 153J	Carbon film	15k	
R55	RD½PSF 102J	Carbon film	1k	½W
R57	RS1PS 101J	Metal oxide	100	1W
R59	RS1PS 101J	Metal oxide	100	1W
R61	RD¼PSF 132J	Carbon film	1.3k	
R63	RD¼PSF 132J	Carbon film	1.3k	
R65	RN1H 4R7K	Metal film	4.7	1W
R67	RD¼PSF 330J	Carbon film	33	
R69	RT5B 0R5K	Wire wound	0.5	5W
R71	RD¼PSF 330J	Carbon film	33	
R73	RT5B 0R5K	Wire wound	0.5	5W
R75	RD¼PSF 330J	Carbon film	33	
R77	RT5B 0R5K	Wire wound	0.5	5W
R79	RT5B 0R5K	Wire wound	0.5	5W
R81	RD¼PSF 330J	Carbon film	33	
R83	RT5B 0R5K	Wire wound	0.5	5W
R85	RD¼PSF 330J	Carbon film	33	
R87	RT5B 0R5K	Wire wound	0.5	5W
R89	RD¼PSF 330J	Carbon film	33	
R91	RN1H 4R7K	Metal film	4.7	1W
R93	RS2P 100J	Metal oxide	10	2W
R95	RS2P 100J	Metal oxide	10	2W
R97	RD¼PSF 202J	Carbon film	2k	
R99	RD½PS 333J	Carbon film	33k	½W
R101	RD½PS 333J	Carbon film	33k	½W
R103	RD¼PSF 202J	Carbon film	2k	
R105	RD¼PSF 150J	Carbon film	15	
R107	RD¼PSF 150J	Carbon film	15	
R109	RD¼PS 124J	Carbon film	120k	
R111	RD¼PSF 221J	Carbon film	220	
R113	RD¼PSF 221J	Carbon film	220	
R115	RD¼PS 163J	Carbon film	16k	

OTHERS

Symbol	Part No.	Description	
L1	ATH-012	Choke coil	1.1μH
	ANH-340	Heat sink	
	AKM-034	4P plug	

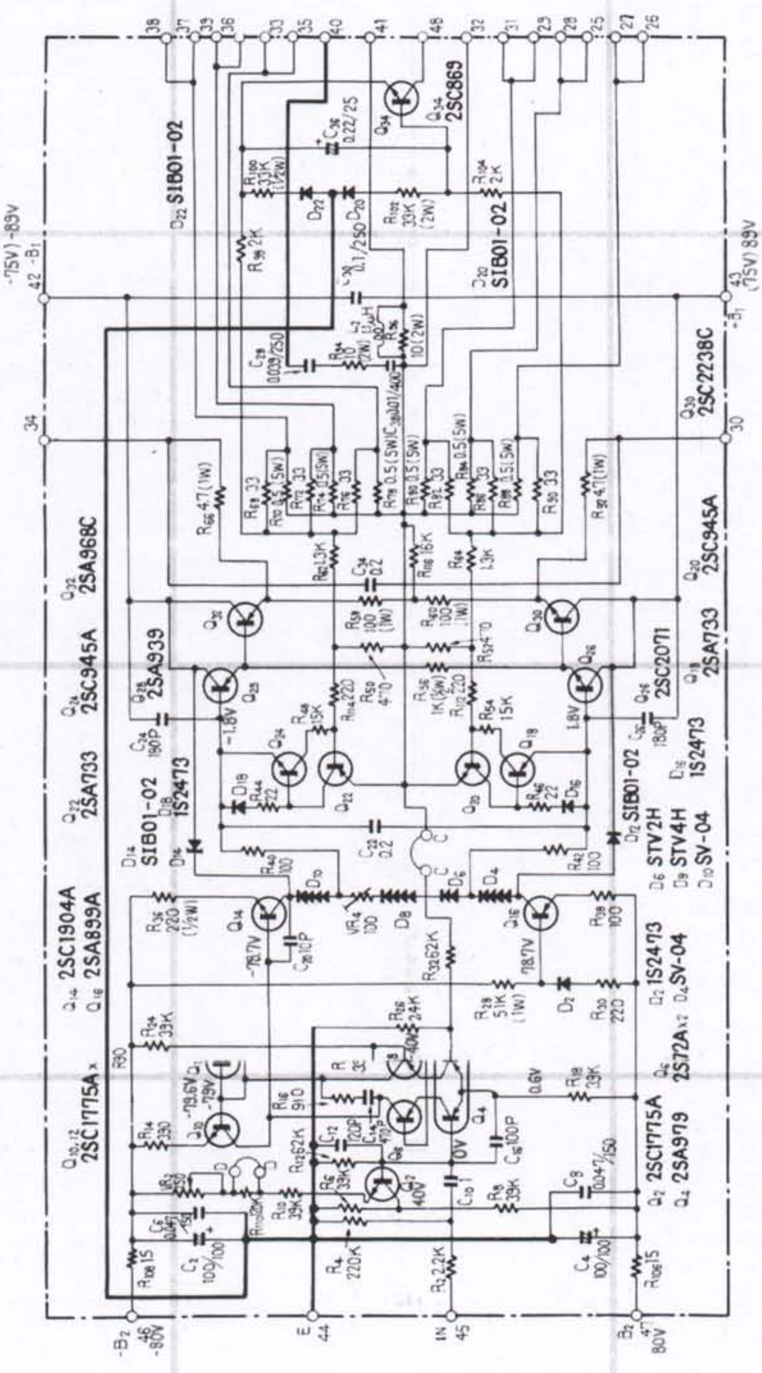
SEMICONDUCTORS

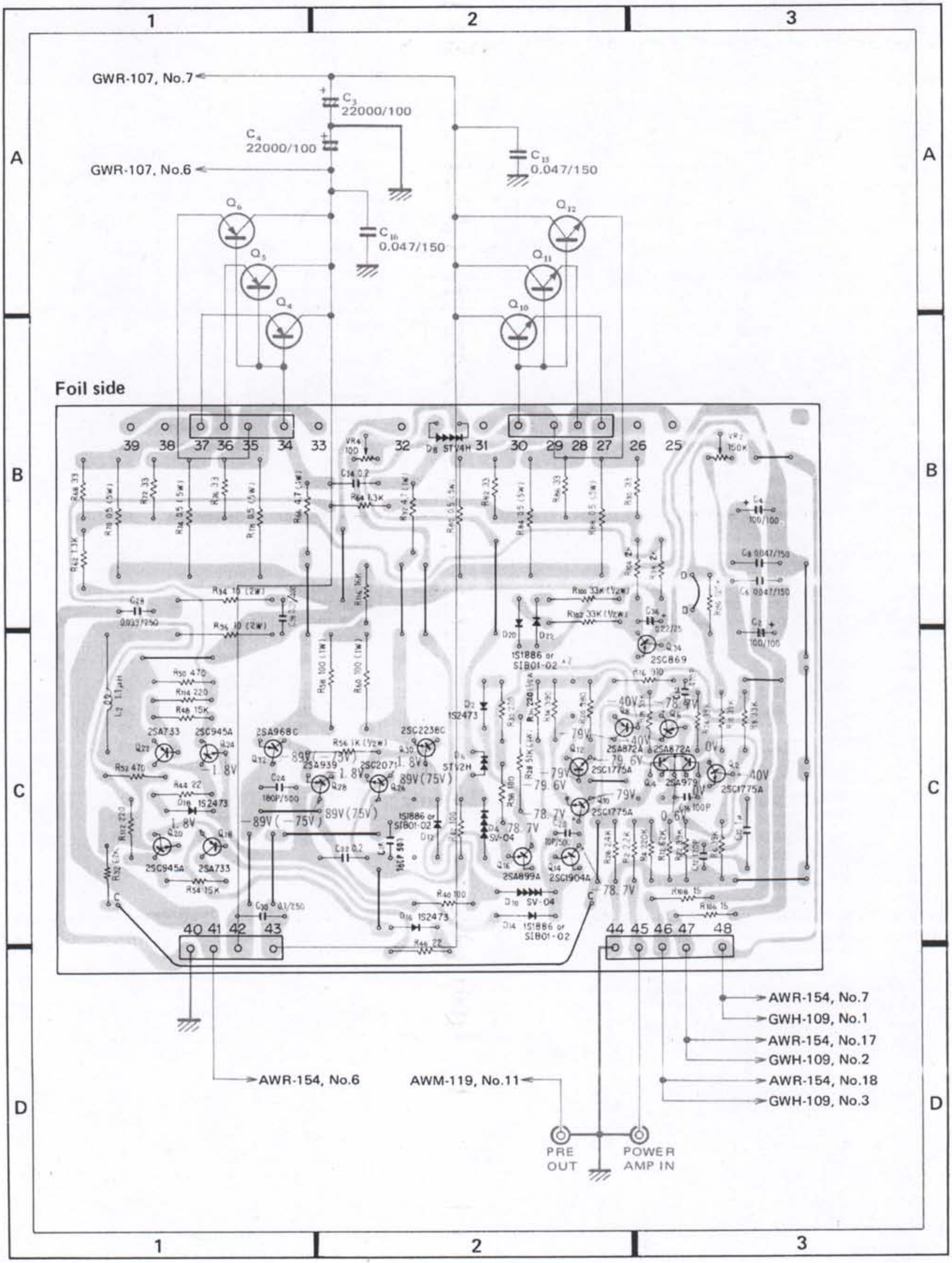
Symbol	Part No.	Description
Q1	2SC 1775A-E	Transistor
Q3	2SA 979-F	Transistor
Q5	2SA 872A-E or D	Transistor
Q7	2SA 872A-E or D	Transistor
Q9	2SC 1775A-F or E	Transistor
Q11	2SC 1775A-F or E	Transistor
Q13	2SC 1904A-V or B	Transistor
Q15	2SA 899A-V or B	Transistor
Q17	2SA 733-Q or R	Transistor
Q19	2SC 945A-Q or R	Transistor
Q21	2SA 733-Q or R	Transistor
Q23	2SC 945A-Q or R	Transistor
Q25	2SC 2071-V or B	Transistor
Q27	2SA 939-V or B	Transistor
Q29	2SC 2238C-O or Y	Transistor
Q31	2SA 968C-O or Y	Transistor
Q33	2SC 869-C or D	Transistor
D1	1S 2473 (1S 1555)	Diode
D3	SV-04	Varistor
D5	STV-2H	Varistor
D7	STV-4H	Varistor
D9	SV-04	Varistor
D11	SIB 01-02 (1S 1886)	Diode
D13	SIB 01-02 (1S 1886)	Diode
D15	1S 2473 (1S 1555)	Diode
D17	1S 2473 (1S 1555)	Diode
D19	SIB 01-02 (1S 1886)	Diode
D21	SIB 01-02 (IS 1886)	Diode

List of Changed Parts for Factory Modification

Symbol	Part No.	Description

12.15 POWER AMPLIFIER R ASSEMBLY (GWH-110)


38
37
39
36
33
35
40
41
48
32
31
29
28
25
27
26
Q34 2SC869
C36 0.22/25
R100 33K (1/2W)
D22 SIB01-02
R99 2K
D22
D20
R102 33K (2W)
R104 2K
D20 SIB01-02
-(75V) -89V
42 -B1
43 (75V) 89V
+B1
C30 0.1/250
C28 0.039/250
R94 10 (2W)
L1 1.1μH
R96 10 (2W)
C38 0.01/400
34
30
Q30 2SC2238C
Q32 2SA968C
R66 4.7 (1W)
R92 4.7 (1W)
Q24 2SC945A
Q28 2SA939
Q22 2SA733
C24 180P
C26 180P
-1.8V
1.8V
D14 SIB01-02
D18 1S2473
C22 0.2
VR4 100
Q14 2SC1904A
Q16 2SA899A
-78.7V
78.7V
Q10,12 2SC1775A
Q2 2SC1775A
Q4 2SA979
Q6 2S72A
D2 1S2473
D4 SV-04
D6 STV2H
D8 STV4H
D10 SV-04
D12 SIB01-02
D16 1S2473
Q20 2SC945A
Q18 2SA733
Q26 2SC2071
C2 100/100
C4 100/100
C8 0.047/50
R106 15
R108 15
R4 220K
R2 2.2K
-B2
46
-80V
E
44
IN
45
B2
47
80V


1
2
3
A
B
C
D
GWR-107, No.7
GWR-107, No.6
C3 22000/100
C4 22000/100
C15 0.047/150
C16 0.047/150
Q6
Q5
Q4
Q12
Q11
Q10
Foil side
39 38 37 36 35 34 33 32 31 30 29 28 27 26 25
VR4 100
D8 STV4H
VR2 150K
C14 0.2
R64 1.3K
R34 10 (2W)
R36 10 (2W)
R100 33K (1/2W)
R102 33K (1/2W)
C28 0.033/250
1S1886 or SIB01-02
2SC869
L2 1.1μH
R50 470
R114 220
R48 15K
2SA733
2SC945A
2SA968C
2SC2238C
2SA939
2SC2071
2SA872A
2SC1775A
2SA979
2SC1904A
2SA899A
STV2H
SV-04
1S2473
R52 470
R44 22
R54 15K
C24 180P/500
C22 0.2
C30 0.1/250
R40 100
R46 22
-89V (-75V)
89V (75V)
-1.8V
1.8V
-79V
-79.6V
-78.7V
78.7V
40V
-40V
0V
0.6V
C4 100/100
C8 0.047/150
C6 0.047/150
C2 100/100
R108 15
R110 15
D10 SV-04
D14 1S1886 or SIB01-02
D16 1S2473
40 41 42 43
44 45 46 47 48
AWR-154, No.7
GWH-109, No.1
AWR-154, No.17
GWH-109, No.2
AWR-154, No.18
GWH-109, No.3
AWR-154, No.6
AWM-119, No.11
PRE OUT
POWER AMP IN

Parts List of Power Amplifier R Assembly (GWH-110)

CAPACITORS

Symbol	Part No.	Description		
C2	CEA 101P 100	Electrolytic	100	100V
C4	CEA 101P 100	Electrolytic	100	100V
C6	ACG-009	Ceramic	0.047	150V
C8	ACG-009	Ceramic	0.047	150V
C10	ACE-008	Metallized mylar	1	100V
C12	CCDSL 121K 50	Ceramic	120p	50V
C14	CCDSL 471K 50	Ceramic	470p	50V
C16	CCDSL 101K 50	Ceramic	100p	50V
C18				
C20	CCDSL 100K 500	Ceramic	10p	500V
C22	CQMA 204K 50	Mylar	0.2	50V
C24	CCDSL 181K 500	Ceramic	180p	500V
C26	CCDSL 181K 500	Ceramic	180p	500V
C28	CQMA 393K 250	Mylar	0.039	250V
C30	CQMA 104K 250	Mylar	0.1	250V
C34	CQMA 204K 50	Mylar	0.2	50V
C36	CSSA R22M 25	Electrolytic	0.22	25V
C38	CQMA 103K 400	Mylar	0.01	400V

RESISTORS

Symbol	Part No.	Description		
VR2	ACP-063	Semi-fixed	(150k-B)	
VR4	ACP-032	Semi-fixed	(100-B)	
R2	RD¼PS 222J	Carbon film	2.2k	
R4	RD½PS 224J NL	Carbon film	220k	
R6	RD¼PS 393J NL	Carbon film	39k	
R8	RD¼PS 393J NL	Carbon film	39k	
R10	RD¼PS 393J NL	Carbon film	39k	
R12	RD¼PS 623J NL	Carbon film	62k	
R14	RD¼PS 391J	Carbon film	390	
R16	RD¼PS 911J	Carbon film	910	
R18	RD¼PS 393J NL	Carbon film	39k	
R20	RD¼PS 391J	Carbon film	390	
R22	RD¼PS 393J NL	Carbon film	39k	
R24	RD¼PS 393J NL	Carbon film	39k	
R26	RD¼PS 242J	Carbon film	2.4k	
R28	RS1P 513J	Metal oxide	51k	
R30	RD¼PSF 221J	Carbon film	220	
R32	RD¼PS 623J NL	Carbon film	62k	
R36	RD½PSF 221J	Carbon film	220	½W
R38	RD¼PSF 101J	Carbon film	100	
R40	RD¼PSF 101J	Carbon film	100	
R42	RD¼PSF 101J	Carbon film	100	
R44	RD¼PSF 220J	Carbon film	22	
R46	RD¼PSF 220J	Carbon film	22	
R48	RD¼PS 153J	Carbon film	15k	
R50	RD¼PSF 471J	Carbon film	470	
R52	RD¼PSF 471J	Carbon film	470	
R54	RD¼PS 153J	Carbon film	15k	
R56	RD½PSF 102J	Carbon film	1k	½W
R58	RS1PS 101J	Metal oxide	100	1W
R60	RS1PS 101J	Metal oxide	100	1W
R62	RD¼PSF 132J	Carbon film	1.3k	
R64	RD¼PSF 132J	Carbon film	1.3k	
R66	RN1H 4R7K	Metal film	4.7	1W
R68	RD¼PSF 330J	Carbon film	33	
R70	RT5B 0R5K	Wire wound	0.5	5W
R72	RD¼PSF 330J	Carbon film	33	
R74	RT5B 0R5K	Wire wound	0.5	5W
R76	RD¼PSF 330J	Carbon film	33	
R78	RT5B 0R5K	Wire wound	0.5	5W
R80	RT5B 0R5K	Wire wound	0.5	5W
R82	RD¼PSF 330J	Carbon film	33	
R84	RT5B 0R5K	Wire wound	0.5	5W
R86	RD¼PSF 330J	Carbon film	33	
R88	RT5B 0R5K	Wire wound	0.5	5W
R90	RD¼PSF 330J	Carbon film	33	
R92	RN1H 4R7K	Metal film	4.7	1W
R94	RS2P 100J	Metal oxide	10	2W
R96	RS2P 100J	Metal oxide	10	2W
R98	RD¼PSF 202J	Carbon film	2k	
R100	RD½PS 333J	Carbon film	33k	½W
R102	RD½PS 333J	Carbon film	33k	½W
R104	RD¼PSF 202J	Carbon film	2k	
R106	RD¼PSF 150J	Carbon film	15	
R108	RD¼PSF 150J	Carbon film	15	
R110	RD¼PS 124J	Carbon film	120k	
R112	RD¼PSF 221J	Carbon film	220	
R114	RD¼PSF 221J	Carbon film	220	
R116	RD¼PS 163J	Carbon film	16k	

OTHERS

Symbol	Part No.	Description	
L2	ATH-012	Choke coil	1.1μH
	ANH-340	Heat sink	
	AKM-034	4P plug	

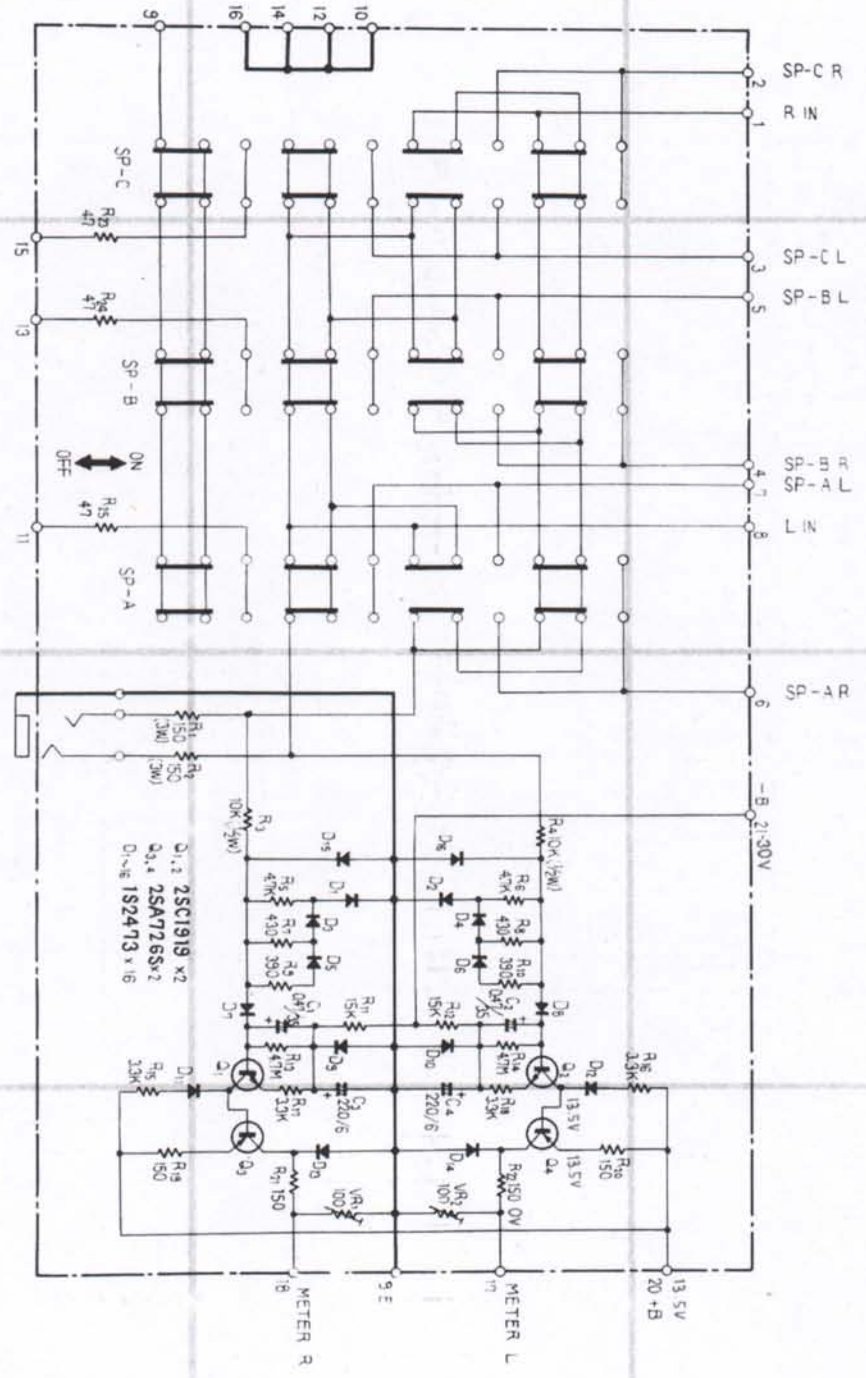
SEMICONDUCTORS

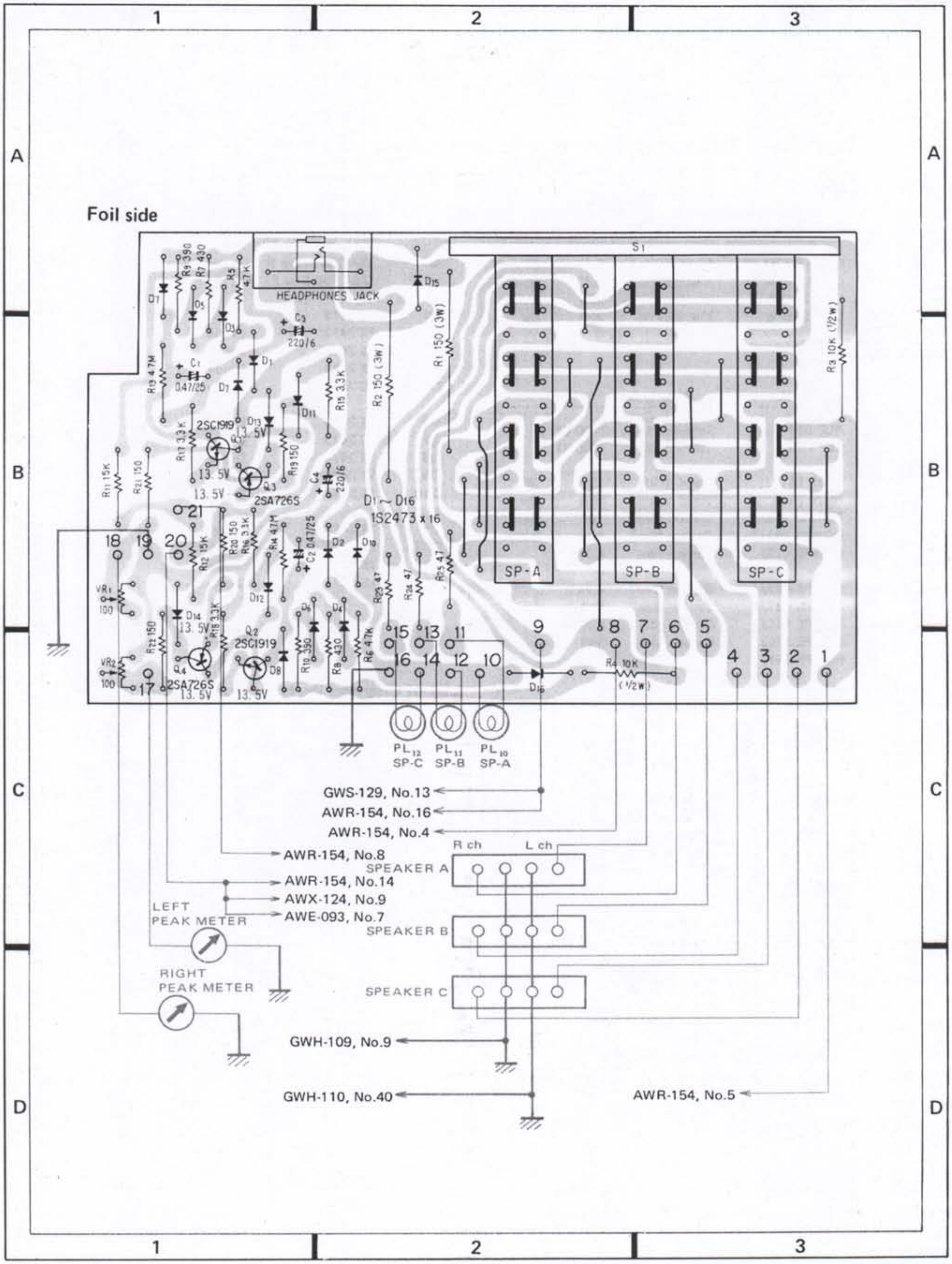
Symbol	Part No.	Description
Q2	2SC 1775A-E	Transistor
Q4	2SA 979-F	Transistor
Q6	2SA 872A-E or D	Transistor
Q8	2SA 872A-E or D	Transistor
Q10	2SC 1775A-F or E	Transistor
Q12	2SC 1775A-F or E	Transistor
Q14	2SC 1904A-V or B	Transistor
Q16	2SA 899A-V or B	Transistor
Q18	2SA 733-Q or R	Transistor
Q20	2SC 945A-Q or R	Transistor
Q22	2SA 733-Q or R	Transistor
Q24	2SC 945A-Q or R	Transistor
Q26	2SC 2071-V or B	Transistor
Q28	2SA 939-V or B	Transistor
Q30	2SC 2238C-O or Y	Transistor
Q32	2SA 698C-O or Y	Transistor
Q34	2SC 869-C or D	Transistor
D2	1S 2473 (1S 1555)	Diode
D4	SV-04	Varistor
D6	STV-2H	Varistor
D8	STV-4H	Varistor
D10	SV-04	Varistor
D12	SIB 01-02 (1S 1886)	Diode
D14	SIB 01-02 (1S 1886)	Diode
D16	1S 2473 (1S 1555)	Diode
D18	1S 2473 (1S 1555)	Diode
D20	SIB 01-02 (1S 1886)	Diode
D22	SIB 01-02 (1S 1886)	Diode

List of Changed Parts for Factory Modification

Symbol	Part No.	Description

12.16 METER AMPLIFIER ASSEMBLY (AWM-122)


SP-C R
R IN
SP-C L
SP-B L
SP-B R
SP-A L
L IN
SP-A R
−B 21-30V
SP-C
SP-B
SP-A
ON
OFF
Q1, 2 2SC1919 x2
Q3, 4 2SA726S x2
D1~16 1S2473 x16
13.5V
0V
METER R
E
METER L
13.5V 20 +B


1
2
3
A
B
C
D
Foil side
HEADPHONES JACK
S1
SP-A
SP-B
SP-C
R9 390
R7 430
R5 47K
R13 4.7M
C1 0.47/25
C3 220/6
R15 3.3K
R2 150 (3W)
R1 150 (3W)
R3 10K (1/2W)
D15
2SC1919
Q1
Q3
2SA726S
13.5V
R17 3.3K
R19 150
C4 220/6
R11 15K
R21 150
R12 15K
R20 150
R16 3.3K
R14 4.7M
C2 0.47/25
D1 ~ D16
1S2473 x 16
R23 47
R24 47
R25 47
VR1 100
VR2 100
R22 150
R18 3.3K
Q4
Q2
2SC1919
D14
R10 390
R8 430
R6 47K
D8
D16
R4 10K (1/2W)
18
19
20
21
17
15
13
11
16
14
12
10
9
8
7
6
5
4
3
2
1
PL12 SP-C
PL11 SP-B
PL10 SP-A
GWS-129, No.13
AWR-154, No.16
AWR-154, No.4
AWR-154, No.8
AWR-154, No.14
AWX-124, No.9
AWE-093, No.7
R ch
L ch
SPEAKER A
SPEAKER B
SPEAKER C
LEFT PEAK METER
RIGHT PEAK METER
GWH-109, No.9
GWH-110, No.40
AWR-154, No.5

Parts List of Meter Amplifier Assembly (AWM-122)

SWITCHES

Symbol	Part No.	Description
S22-24	ASG-130	Push switch (SPEAKERS)

CAPACITORS

Symbol	Part No.	Description		
C1	CSZA R47M 35	Electrolytic	0.47	35V
C2	CSZA R47M 35	Electrolytic	0.47	35V
C3	CEA 221P 6	Electrolytic	220	6V
C4	CEA 221P 6	Electrolytic	220	6V

RESISTORS

Symbol	Part No.	Description		
VR1	ACP-019	Semi-fixed	(100-B)	
VR2	ACP-019	Semi-fixed	(100-B)	
R1	RS3P 151J	Metal oxide	150	3W
R2	RS3P 151J	Metal oxide	150	3W
R3	RD½PS 103J	Carbon film	10k	½W
R4	RD½PS 103J	Carbon film	10k	½W
R5	RD¼PS 472J	Carbon film	4.7k	
R6	RD¼PS 472J	Carbon film	4.7k	
R7	RD¼PS 431J	Carbon film	430	
R8	RD¼PS 431J	Carbon film	430	
R9	RD¼PS 391J	Carbon film	390	
R10	RD¼PS 391J	Carbon film	390	
R11	RD¼PS 153J	Carbon film	15k	
R12	RD¼PS 153J	Carbon film	15k	
R13	RD¼PS 475J	Carbon film	4.7M	
R14	RD¼PS 475J	Carbon film	4.7M	
R15	RD¼PS 332J	Carbon film	3.3k	
R16	RD¼PS 332J	Carbon film	3.3k	
R17	RD¼PS 332J	Carbon film	3.3k	
R18	RD¼PS 332J	Carbon film	3.3k	
R19	RD¼PSF 151J	Carbon film	150	
R20	RD¼PSF 151J	Carbon film	150	
R21	RD¼PSF 151J	Carbon film	150	
R22	RD¼PSF 151J	Carbon film	150	
R23	RD¼PS 470J	Carbon film	47	
R24	RD¼PS 470J	Carbon film	47	
R25	RD½PS 470J	Carbon film	47	

OTHER

Symbol	Part No.	Description
	AKN-010	Phone Jack (PHONES)

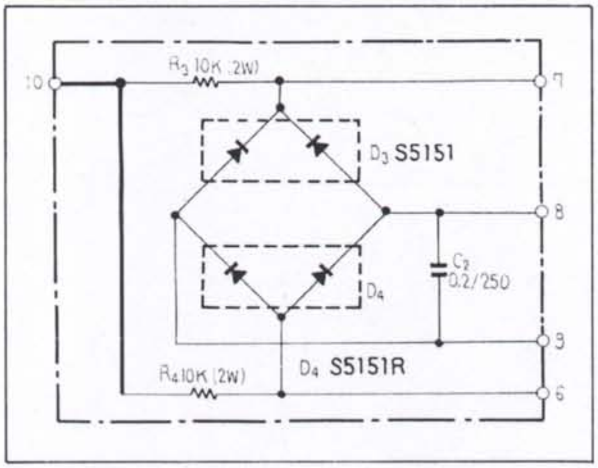
SEMICONDUCTORS

Symbol	Part No.	Description
Q1	2SC 1919-G or F (2SC 1400-E or F)	Transistor
Q2	2SC 1919-G or F (2SC 1400-E or F)	Transistor
Q3	2SA 726S-G or F (2SA 750-E or F)	Transistor
Q4	2SA 726S-G or F (2SA 750-E or F)	Transistor
Q1	1S 2473	Diode
Q2	1S 2473	Diode
Q3	1S 2473	Diode
Q4	1S 2473	Diode
Q5	1S 2473	Diode
Q6	1S 2473	Diode
Q7	1S 2473	Diode
Q8	1S 2473	Diode
Q9	1S 2473	Diode
Q10	1S 2473	Diode
Q11	1S 2473	Diode
Q12	1S 2473	Diode
Q13	1S 2473	Diode
Q14	1S 2473	Diode
Q15	1S 2473	Diode
Q16	1S 2473	Diode

List of Changed Parts for Factory Modification

Symbol	Part No.	Description

12.17 RECTIFIER R ASSEMBLY (GWR-107)


10
R_3 10K (2W)
7
D_3 S5151
8
C_2 0.2/250
D_4
9
R_4 10K (2W)
D_4 S5151R
6

Parts List

CAPACITOR

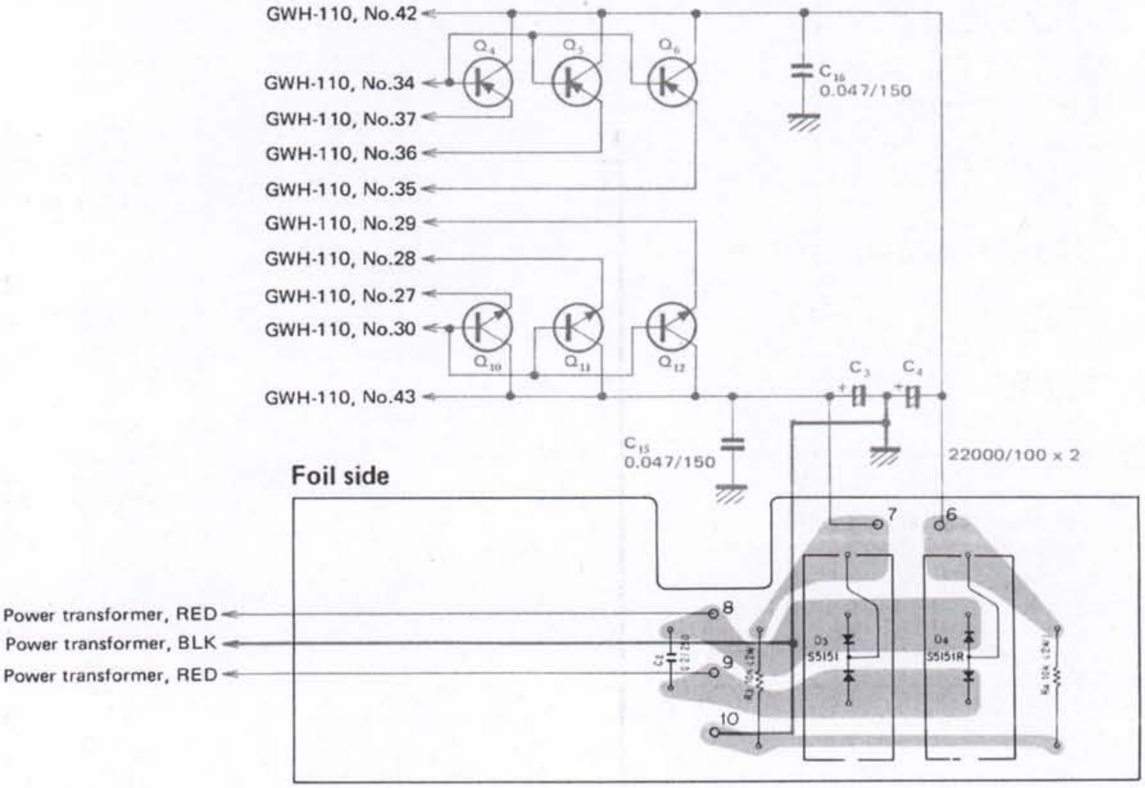
Symbol	Part No.	Description		
C2	CQMA 204J 250	Mylar	0.2	250V

RESISTORS

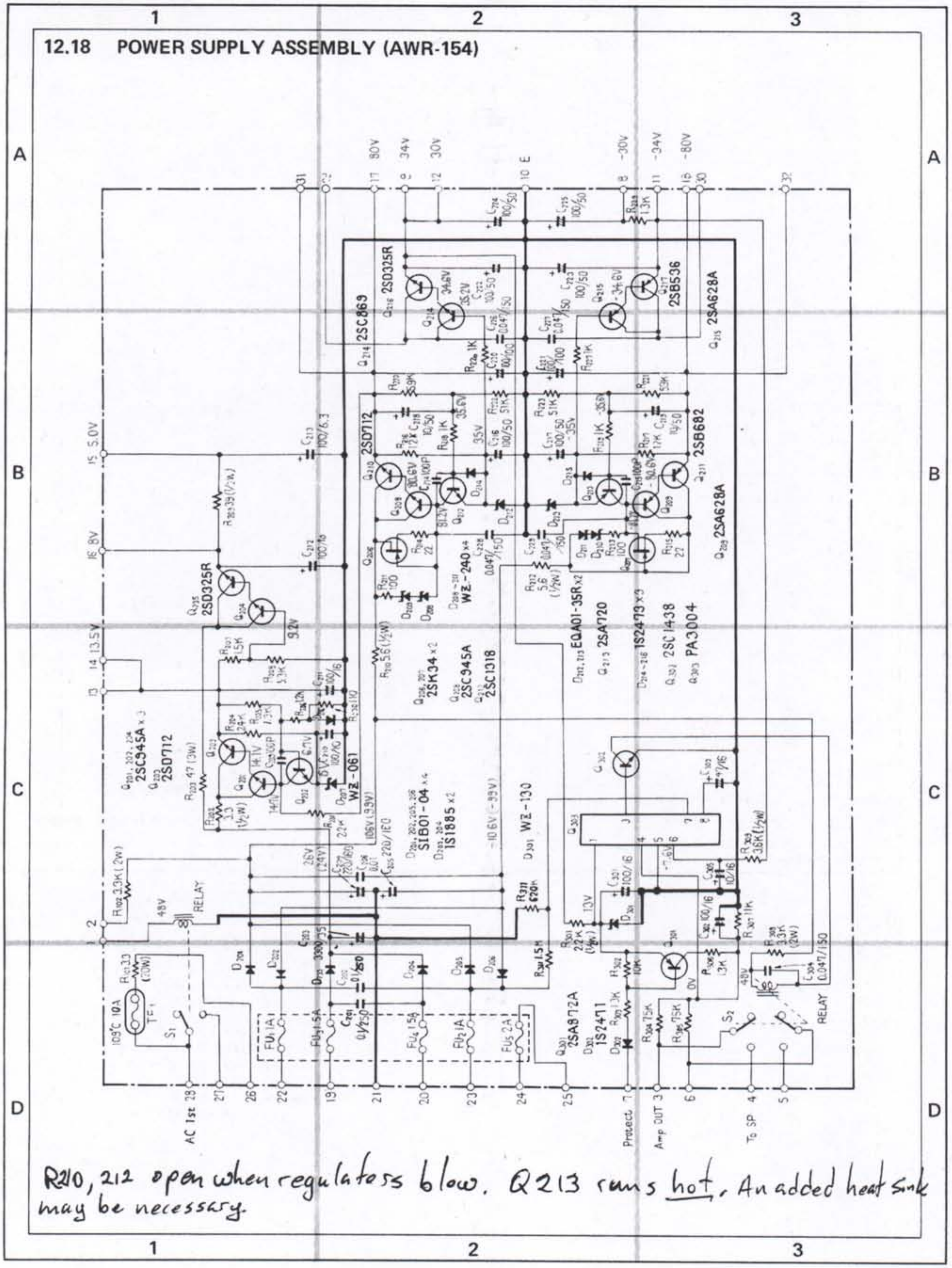
Symbol	Part No.	Description		
R3	RS2P 103J	Metal oxide	10k	2W
R4	RS2P 103J	Metal oxide	10k	2W

SEMICONDUCTORS

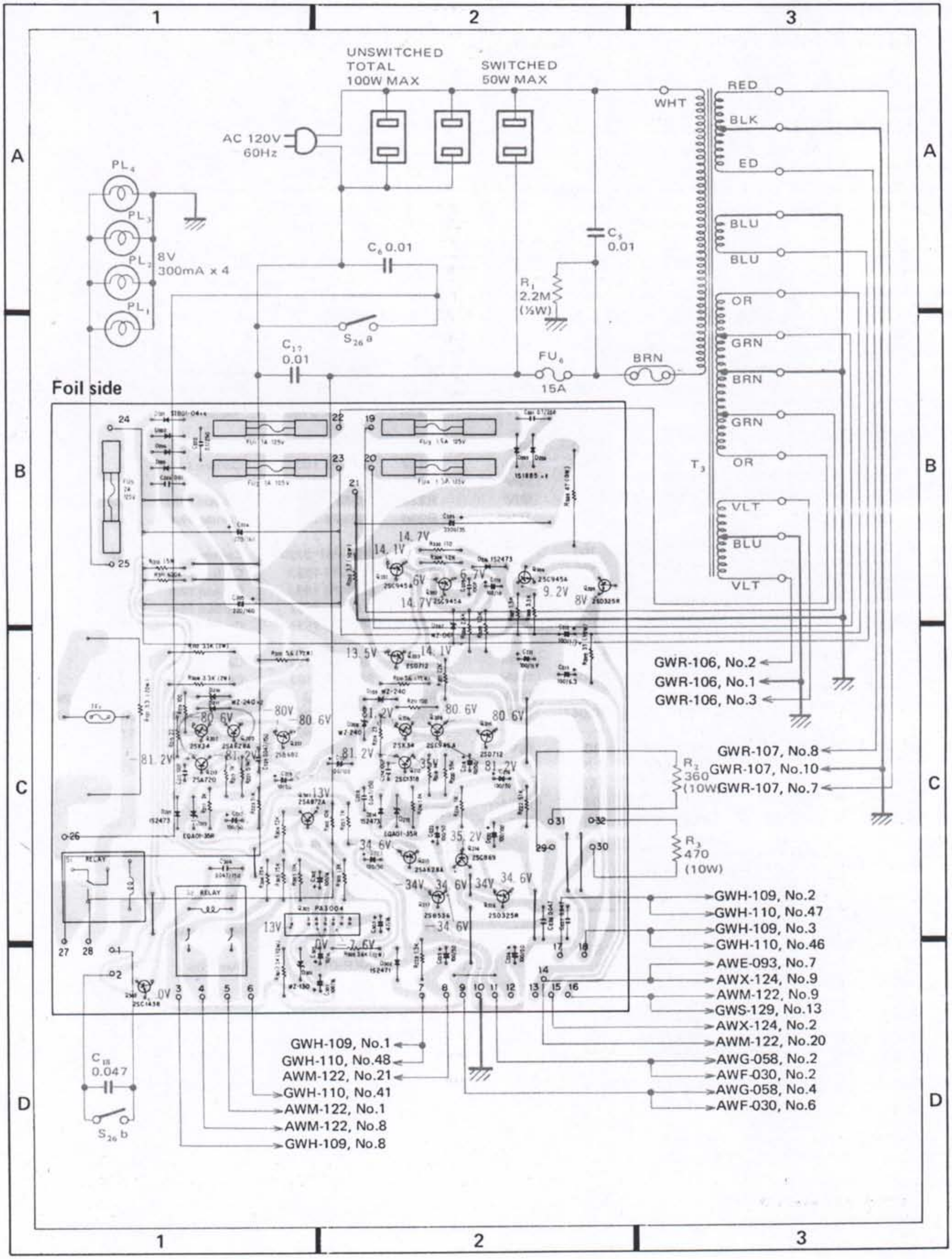
Symbol	Part No.	Description
D3	S5151	Diode
D4	S5151R	Diode


GWH-110, No.42
GWH-110, No.34
GWH-110, No.37
GWH-110, No.36
GWH-110, No.35
GWH-110, No.29
GWH-110, No.28
GWH-110, No.27
GWH-110, No.30
GWH-110, No.43
Q_4
Q_5
Q_6
C_{16} 0.047/150
Q_{10}
Q_{11}
Q_{12}
C_3
C_4
C_{15} 0.047/150
22000/100 x 2
Foil side
7
6
Power transformer, RED
Power transformer, BLK
Power transformer, RED
8
9
10
D_3 S5151
D_4 S5151R

12.18 POWER SUPPLY ASSEMBLY (AWR-154)


1
2
3
A
B
C
D
31
32
17 80V
9 34V
12 30V
10 E
8 -30V
11 -34V
16 -80V
30
32
15 5.0V
16 8V
13.5V
14
13
2
1
AC 1st 28
27
26
22
19
21
20
23
24
25
Protect 7
Amp OUT 3
6
To SP 4
5
Q214 2SC869
Q216 2SD325R
Q217 2SB536
Q215 2SA628A
Q210 2SD712
Q211 2SB682
Q209 2SA628A
Q205 2SD325R
Q201, 202, 204 2SC945A x3
Q203 2SD712
Q206, 207 2SK34 x2
Q208 2SC945A
Q212 2SC1318
D212, 213 EQA01-35R x2
Q213 2SA720
D214~216 1S2473 x3
Q302 2SC1438
Q303 PA3004
D201, 202, 205, 206 S1B01-04 x4
D203, 204 1S1885 x2
D207 WZ-061
D208~211 WZ-240 x4
D301 WZ-130
Q301 2SA872A
D302 1S2471
C213 100/6.3
C212 100/16
C224 100/50
C225 100/50
C222 100/50
C223 100/50
C226 0.047/50
C227 0.047/50
C216 100/50
C217 100/50
C218 10/50
C219 10/50
C228 0.047/150
C229 0.047/150
C203 3300/35
C201 0.01/250
C220 100/100
C221 100/100
R203 39 (1/2W)
R202 47 (3W)
R102 3.3K (2W)
R101 3.3 (20W)
R211 100
R210 5.6 (1/2W)
R212 5.6 (1/2W)
R214 22
R215 27
R224 1K
R225 1K
R226 12K
R227 12K
R222 51K
R223 51K
R220 59K
R221 59K
R228 13K
R311 620
R310 1.5K
R301 2.2K (1/4W)
R302 10K
R303 13K
R304 75K
R305 75K
R306 13K
R307 11K
R308 3.3K (2W)
R309 3.6K (1/2W)
C301 100/16
C302 100/16
C303 47/16
C304 0.047/150
C305 10/16
C206 220/160
C207 120/160
RELAY
48V
13V
-10.6V (-9.9V)
106V (99V)
26V (124V)
-34.6V
34.6V
35.2V
35V
-35V
35.6V
-35.6V
80.6V
-80.6V
81.2V
-81.2V
9.2V
14.1V
6.7V
0V
-7.6V
TF1
S1
S2
109°C 10A
FU1 1A
FU3 1.5A
FU4 1.5A
FU2 1A
FU5 2A

R210, 212 open when regulators blow. Q213 runs _hot_. An added heat sink may be necessary.


1
2
3
A
B
C
D
UNSWITCHED TOTAL 100W MAX
SWITCHED 50W MAX
AC 120V 60Hz
WHT
RED
BLK
ED
BLU
BLU
OR
GRN
BRN
GRN
OR
VLT
BLU
VLT
T_3
PL_4
PL_3
PL_2
PL_1
8V 300mA x 4
C_6 0.01
C_5 0.01
R_1 2.2M (½W)
S_{26} a
C_{17} 0.01
FU_6 15A
BRN
Foil side
14.7V
14.1V
6V
6.7V
9.2V
8V
14.7V
13.5V
14.1V
-80V
-80.6V
80.6V
80.6V
80.6V
-81.2V
81.2V
81.2V
81.2V
35V
81.2V
13V
34.6V
35.2V
-34V
34.6V
34V
34.6V
-34.6V
13V
0V
-2.6V
0V
RELAY
RELAY
PA3004
2SC1458
R_2 360 (10W)
R_3 470 (10W)
GWR-106, No.2
GWR-106, No.1
GWR-106, No.3
GWR-107, No.8
GWR-107, No.10
GWR-107, No.7
GWH-109, No.2
GWH-110, No.47
GWH-109, No.3
GWH-110, No.46
AWE-093, No.7
AWX-124, No.9
AWM-122, No.9
GWS-129, No.13
AWX-124, No.2
AWM-122, No.20
AWG-058, No.2
AWF-030, No.2
AWG-058, No.4
AWF-030, No.6
GWH-109, No.1
GWH-110, No.48
AWM-122, No.21
GWH-110, No.41
AWM-122, No.1
AWM-122, No.8
GWH-109, No.8
C_{18} 0.047
S_{26} b
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32

Parts List of Power Supply Assembly (AWR-154)

CAPACITORS

Symbol	Part No.	Description		
C201	CQMA 104K 250	Mylar	0.1	250V
C202	CQMA 104K 250	Mylar	0.1	250V
C203	ACH-332	Electrolytic	3300	35V
C204	ACH-331	Electrolytic	220	160V
C205	ACH-331	Electrolytic	220	160V
C206	ACG-001	Ceramic	0.01	250V
C209	CCDSL 101K 50	Ceramic	100p	50V
C210	CEA 101P 10	Electrolytic	100	10V
C211	CEA 101P 16	Electrolytic	100	16V
C212	CEA 101P 10	Electrolytic	100	10V
C213	CEA 101P 6	Electrolytic	100	6V
C214	CCDSL 101K 50	Ceramic	100p	50V
C215	CCDSL 101K 50	Ceramic	100p	50V
C216	CEA 101P 50	Electrolytic	100	50V
C217	CEA 101P 50	Electrolytic	100	50V
C218	CEA 100P 50	Electrolytic	10	50V
C219	CEA 100P 50	Electrolytic	10	50V
C220	CEA 101P 100	Electrolytic	100	100V
C221	CEA 101P 100	Electrolytic	100	100V
C222	CEA 101P 50	Electrolytic	100	50V
C223	CEA 101P 50	Electrolytic	100	50V
C224	CEA 101P 50	Electrolytic	100	50V
C225	CEA 101P 50	Electrolytic	100	50V
C226	ACG-009	Ceramic	0.047	150V
C227	ACG-009	Ceramic	0.047	150V
C228	ACG-009	Ceramic	0.047	150V
C229	ACG-009	Ceramic	0.047	150V
C301	CEA 101P 16	Electrolytic	100	16V
C302	CEA 101P 16	Electrolytic	100	16V
C303	CEA 470P 16	Electrolytic	47	16V
C304	ACG-009	Ceramic	0.047	150V
C305	CEA 100P 16	Electrolytic	10	16V

RESISTORS

Symbol	Part No.	Description		
R101	ACN-019	Wire wound	3.3	20W
R102	RS2P 332J	Metal oxide	3.3k	2W
R201	RD¼PS 223J	Carbon film	22k	
R202	RD½PSF 3R3J	Carbon film	3.3	½W
R203	RS3P 470J	Metal oxide	47	3W
R204	RD¼PS 242J	Carbon film	2.4k	
R205	RD¼PS 132J	Carbon film	1.3k	
R206	RD¼PS 122J	Carbon film	1.2k	
R207	RD¼PS 152J	Carbon film	1.5k	
R208	RD¼PS 332J	Carbon film	3.3k	
R209	RD½PSF 390J	Carbon film	39	½W
R210	RD½PSF 5R6J	Carbon film	5.6	½W
R211	RD¼PSF 101J	Carbon film	100	
R212	RD½PSF 5R6J	Carbon film	5.6	½W
R213	RD¼PSF 101J	Carbon film	100	
R214	RD¼PSF 220J	Carbon film	22	
R215	RD¼PSF 220J	Carbon film	22	
R216	RD¼PS 123J	Carbon film	12k	
R217	RD¼PS 123J	Carbon film	12k	
R218	RD¼PS 102J	Carbon film	1k	
R219	RD¼PS 102J	Carbon film	1k	
R220	RN½PT 5902F	Metal film	59k	½W
R221	RN½PT 5902F	Metal film	59k	½W
R222	RN½PT 5102F	Metal film	51k	½W
R223	RN½PT 5102F	Metal film	51k	½W
R226	RD¼PS 102J	Carbon film	1k	
R227	RD¼PS 102J	Carbon film	1k	
R228				
R229	RD¼PS 132J	Carbon film	1.3k	
R230	RD¼PS 111J	Carbon film	110	
R301	RD½PSF 222J	Carbon film	2.2k	½W
R302	RD¼PS 103J	Carbon film	10k	
R303	RD¼PS 133J	Carbon film	13k	
R304	RD¼PS 753J	Carbon film	75k	
R305	RD¼PS 753J	Carbon film	75k	
R306	RD¼PS 132J	Carbon film	1.3k	
R307	RD¼PS 113J	Carbon film	11k	
R308	RS2P 332J	Metal oxide	3.3k	2W
R309	RD½PSF 362J	Carbon film	3.6k	½W
R310	RD¼PS 155J	Carbon film	1.5M	
R311	RD¼PS 624J	Carbon film	620k	

OTHERS

Symbol	Part No.	Description
S1	ASR-046	Relay (primary)
S2	ASR-048	Relay (protection)
TF	AEX-001	Microtemp
	AKR-013	Fuse clip
	ANH-340	Heat sink
	ANH-203	Heat sink
	ANH-425	Heat sink
	AKH-002	Transistor socket
	AEC-088	Insulator spacer

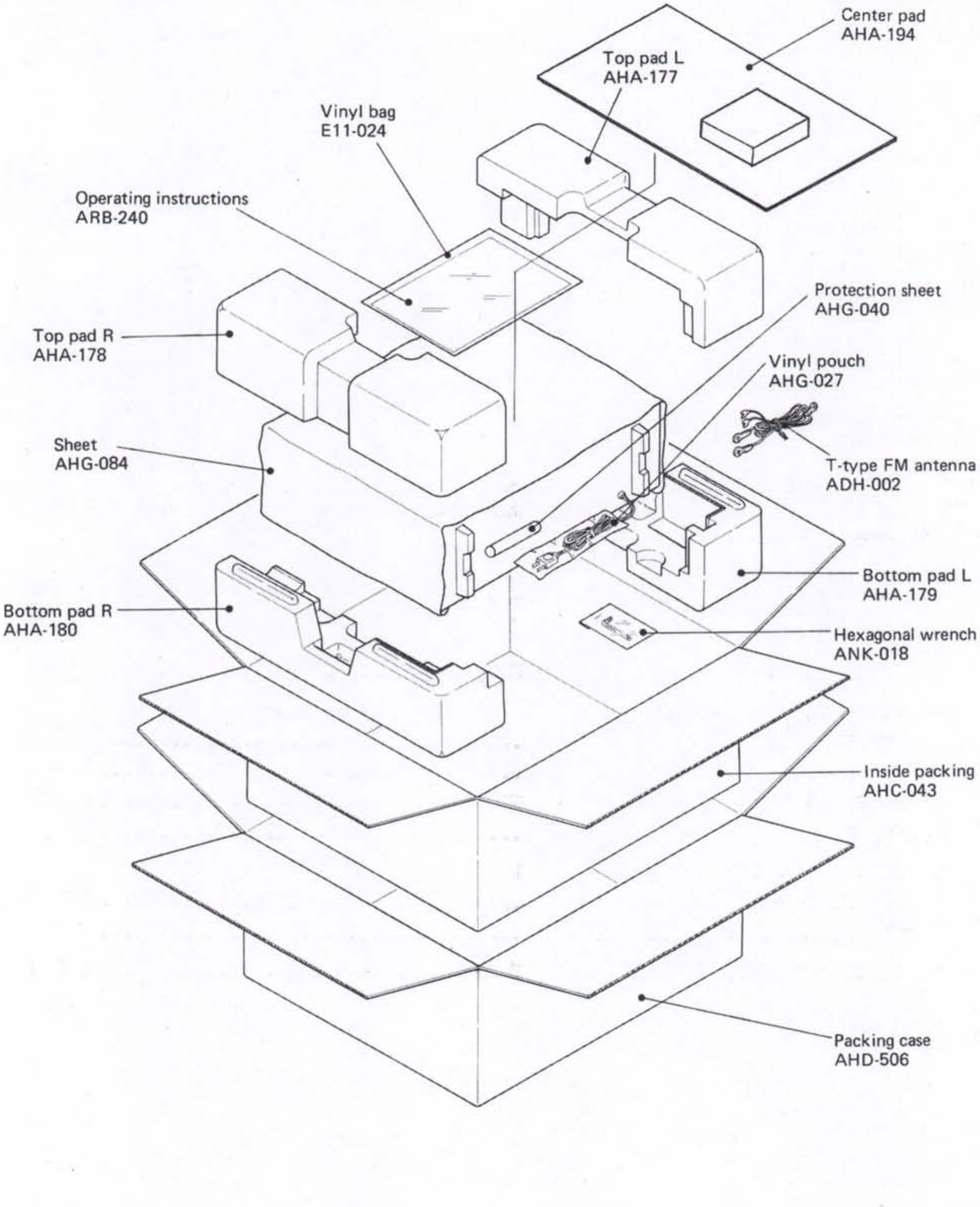
SEMICONDUCTORS

Symbol	Part No.	Descriprion
Q201	2SC945A-Q,RorS	Transistor
Q202	2SC945A-Q,RorS	Transistor
Q203	2SD712-C or D	Transistor
Q204	2SC945A-Q,RorS	Transistor
Q205	2SD325R-E or D	Transistor
Q206	2SK34-C or D	FET
Q207	2SK34-C or D	FET
Q208	2SC945A-Q,RorS	Transistor
Q209	2SA628A-C or D	Transistor
Q210	2SD712-C or D	Transistor
Q211	2SB682-C or D	Transistor
Q212	2SC1318-Q or R	Transistor
Q213	2SA720-Q or R	Transistor
Q214	2SC869-C or D	Transistor
Q215	2SA628A-C or D	Transistor
Q216	2SD325R-E or D	Transistor
Q217	2SB536-L or M	Transistor
Q301	2SA872A-E or D (2SA904-F)	Transistor
Q302	2SC1438-V or B	Transistor
Q303	PA3004	IC
D201	SIB 01-04	Diode
D202	SIB 01-04	Diode
D203	1S1885 (SIB 01-02)	Diode
D204	1S1885 (SIB 01-02)	Diode
D205	SIB 01-04	Diode
D206	SIB 01-04	Diode
D207	WZ-061	Zener diode
D208	WZ-240 (MZ-240)	Zener diode
D209	WZ-240 (MZ-240)	Zener diode
D210	WZ-240 (MZ-240)	Zener diode
D211	WZ-240 (MZ-240)	Zener diode
D212	EQA 01-35R	Zener diode
D213	EQA 01-35R	Zener diode
D214	1S2473	Diode
D215	1S2473	Diode
D216	1S2473	Diode
D301	WZ-130 (MZ-130)	Zener diode
D302	1S2471	Diode

List of Changed Parts for Factory Modification

Symbol	Part No.	Description

13. PACKING



Center pad
AHA-194
Top pad L
AHA-177
Vinyl bag
E11-024
Operating instructions
ARB-240
Protection sheet
AHG-040
Top pad R
AHA-178
Vinyl pouch
AHG-027
Sheet
AHG-084
T-type FM antenna
ADH-002
Bottom pad L
AHA-179
Bottom pad R
AHA-180
Hexagonal wrench
ANK-018
Inside packing
AHC-043
Packing case
AHD-506

ADDITIONAL

Service Manual

PIONEER

AM/FM STEREO RECEIVER

SX-1980

HG
S
S/G

This additional service manual is applicable to HG, S and S/G types. For servicing of HG, S and S/G types please refer to KU type manual (pp. 1-104) with exception of descriptions in this manual.

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    2.1 Exploded View of Rear Panel 108
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1. CONTRAST OF MISCELLANEOUS PARTS

FUSES

Symbol	Part No.				Description
	KU type	HG type	S type	S/G type	
FU1	AEK-106	AEK-402	AEK-106	AEK-106	Fuse 1A
FU2	AEK-106	AEK-402	AEK-106	AEK-106	Fuse 1A
FU3	AEK-104	....	AEK-104	AEK-104	Fuse 1.5A
	....	AEK-402	....	....	Fuse 1A
FU4	AEK-104	....	AEK-104	AEK-104	Fuse 1.5A
	....	AEK-402	....	....	Fuse 1A
FU5	AEK-103	....	AEK-103	AEK-103	Fuse 2A
	....	AEK-405	....	....	Fuse 1.6A
FU6	AEK-303	....	AEK-112	AEK-112	Fuse 15A (for 110/120V)
	....	....	AEK-110	AEK-110	Fuse 8A (for 220/240V)
	....	AEK-404	....	....	Fuse 6.3A

SWITCHES

Symbol	Part No.				Description
	KU type	HG type	S type	S/G type	
S26	ASA-504	ASA-505	ASK-133	ASK-133	Lever switch (POWER)
S28	....	....	ASH-016	ASH-016	Slide switch (DE-EMPHASIS)
	....	AKX-037	....	....	Plug in selector (2-position)
S29	....	....	AKR-031	AKR-031	Plug in selector (4-position with fuse holder)

CAPACITORS

Symbol	Part No.				Description
	KU type	HG type	S type	S/G type	
C5	ACG-003	....	....	....	Ceramic 0.01 125V
	....	ACG-001	ACG-001	ACG-001	Ceramic 0.01 250V
C6	ACG-003	....	....	....	Ceramic 0.01 125V
	....	....	ACG-001	ACG-001	Ceramic 0.01 250V
C17	ACG-003	....	....	....	Ceramic 0.01 125V
C18	ACG-009	....	....	....	Ceramic 0.047 150V

RESISTOR

Symbol	Part No.				Description
	KU type	HG type	S type	S/G type	
R1	RD½PS 225J	....	....	....	Carbon film 2.2M ½W

TRANSFORMER

Symbol	Part No.				Description
	KU type	HG type	S type	S/G type	
T3	ATT-446	ATT-464	ATT-472	ATT-473	Power transformer

OTHERS

Symbol	Part No.				Description
	KU type	HG type	S type	S/G type	
	AWM-122	AWM-126	AWM-122	AWM-122	Meter amplifier assembly
	AWR-154	AWR-155	AWR-154	AWR-154	Power supply assembly
	....	AWX-062	AWX-062	AWX-062	5P connector assembly
	AKA-004	AKA-005	AKA-004	AKA-004	Terminal (ANTENNA)
	AKR-032	K91-008	....	....	Fuse holder 1P
	AKP-005	....	AKP-020	AKP-020	AC socket (AC OUTLETS)
	....	AKP-008	....	....	Recessed plug (AC INLET)
	ADG-013	....	ADG-015	ADG-015	AC power cord
	....	AKC-030	....	....	Terminal strip 2P
	AEC-279	AEC-099	AEC-099	AEC-099	Capacitor cover
	ANH-365	ANH-424	ANH-365	ANH-365	Heat sink
	....	ANE-191	....	....	Heat sink cover

PACKING

Symbol	Part No.				Description
	KU type	HG type	S type	S/G type	
	AHD-506	AHD-514	AHD-506	AHD-512	Packing case
	AHC-043	AHC-049	AHC-043	AHC-043	Inside packing
	AHG-027	....	AHG-027	AHG-027	Vinyl pouch (for AC power cord)
	....	....	....	AHB-091	Cardboard spacer

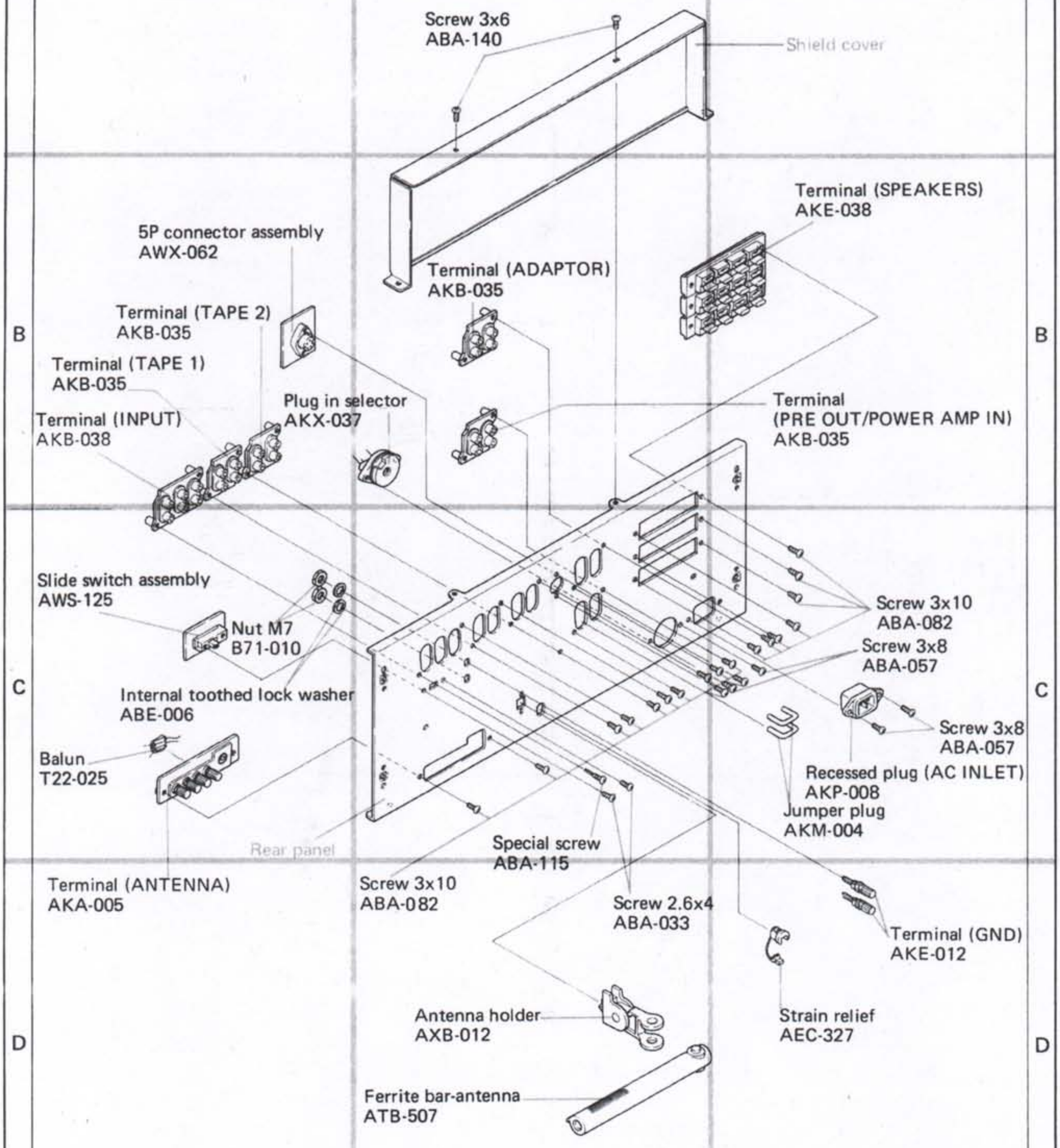
FURNISHED PARTS

Symbol	Part No.				Description
	KU type	HG type	S type	S/G type	
	ARB-240	ARB-242	ARB-241	ARB-241	Operating instructions (English)
	....	ARD-112	....	....	Operating instructions (German/French)
	....	....	AEK-112	AEK-112	Fuse 15A
	....	....	AEK-110	AEK-110	Fuse 8A
	....	....	E11-033	E11-033	Vinyl pouch (for fuses)

2. SUPPLEMENTS FOR HG TYPE

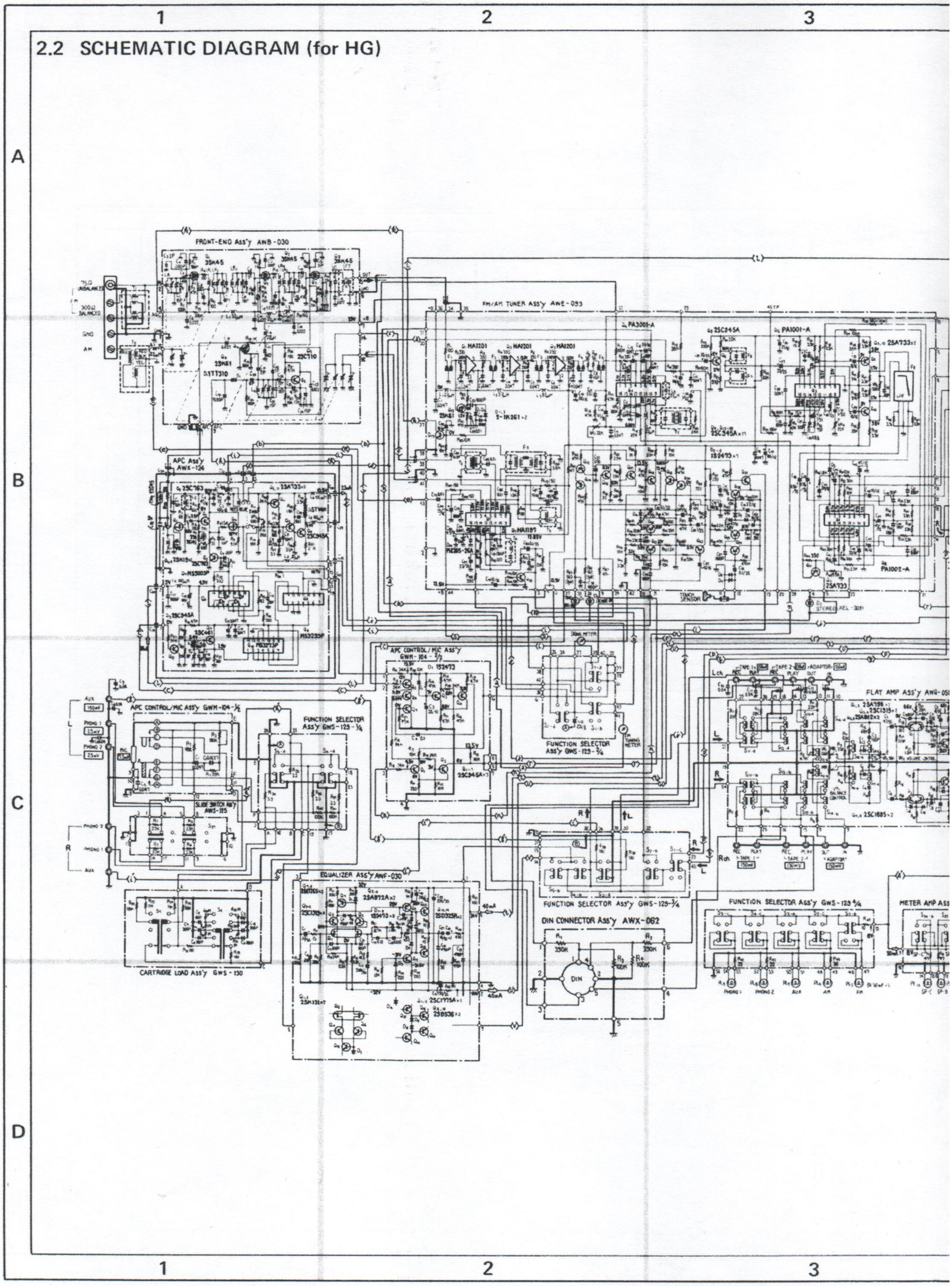
2.1 EXPLODED VIEW OF REAR PANEL

NOTE:
Parts indicated in green type cannot be supplied.



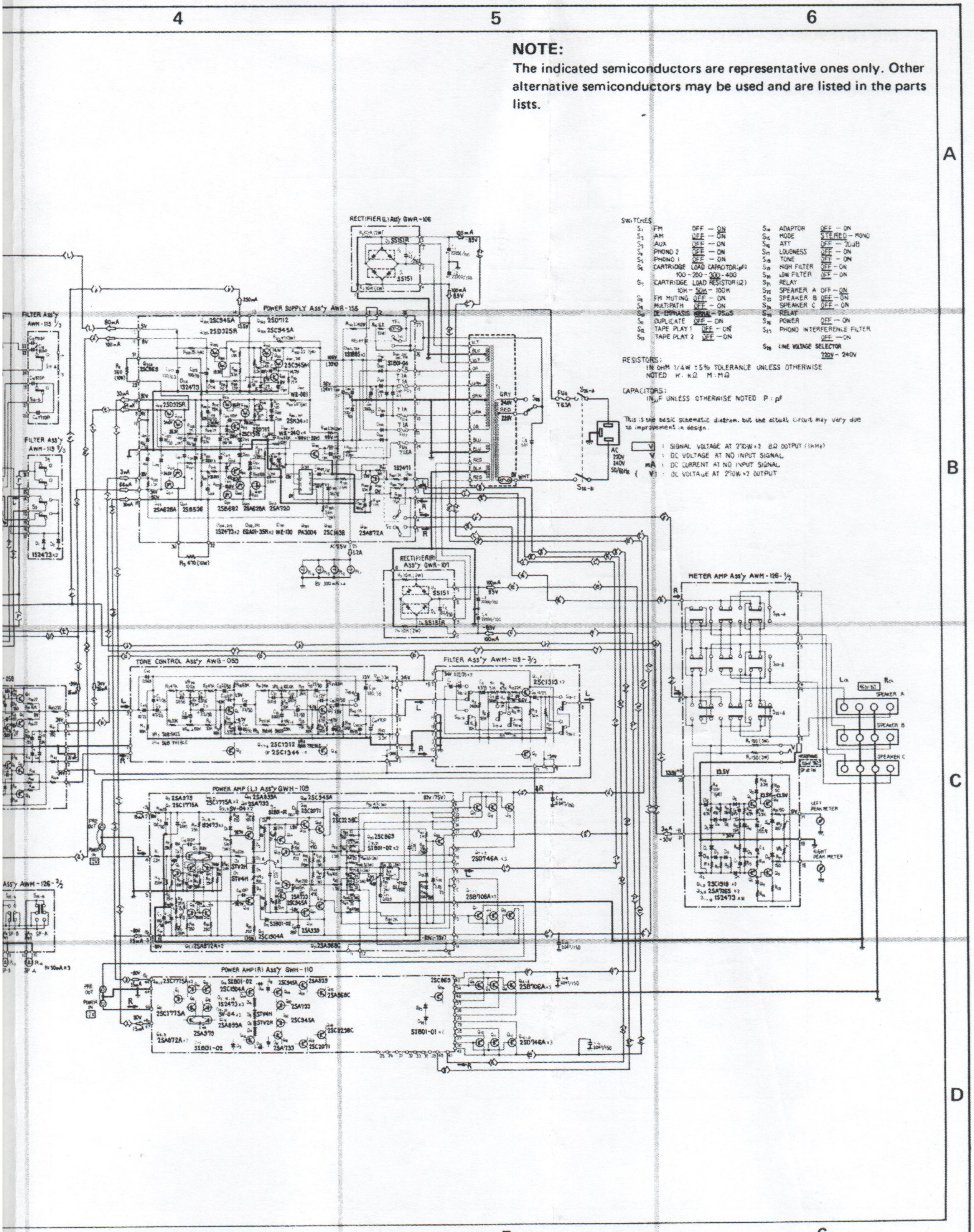
Screw 3x6
ABA-140
Shield cover
Terminal (SPEAKERS)
AKE-038
5P connector assembly
AWX-062
Terminal (ADAPTOR)
AKB-035
Terminal (TAPE 2)
AKB-035
Terminal (TAPE 1)
AKB-035
Plug in selector
AKX-037
Terminal (INPUT)
AKB-038
Terminal
(PRE OUT/POWER AMP IN)
AKB-035
Slide switch assembly
AWS-125
Nut M7
B71-010
Screw 3x10
ABA-082
Screw 3x8
ABA-057
Internal toothed lock washer
ABE-006
Screw 3x8
ABA-057
Balun
T22-025
Recessed plug (AC INLET)
AKP-008
Jumper plug
AKM-004
Rear panel
Special screw
ABA-115
Terminal (ANTENNA)
AKA-005
Screw 3x10
ABA-082
Screw 2.6x4
ABA-033
Terminal (GND)
AKE-012
Antenna holder
AXB-012
Strain relief
AEC-327
Ferrite bar-antenna
ATB-507

2.2 SCHEMATIC DIAGRAM (for HG)


1
2
3
A
B
C
D
FRONT-END Ass'y AWB-030
3SK45
2SK61
2SC710
3.1TT310
75Ω UNBALANCED
300Ω BALANCED
FM
GND
AM
FM/AM TUNER Ass'y AWE-093
HA1201
PA3001-A
2SC945A
PA1001-A
2SA733
2-1K261
HA1137
PA1002-A
TOUCH SENSOR
STEREO LAMP
APC Ass'y AWX-126
2SC763
2SA733
2SC945A
2SK19
MS5003P
2SC461
MS3235P
APC CONTROL/MIC Ass'y GWM-104-1/2
APC CONTROL/MIC Ass'y GWM-104-2/2
1S2473
FUNCTION SELECTOR Ass'y GWS-123-1/4
FUNCTION SELECTOR Ass'y GWS-123-2/4
FUNCTION SELECTOR Ass'y GWS-123-3/4
FUNCTION SELECTOR Ass'y GWS-123-4/4
SIGNAL METER
TUNING METER
SLIDE SWITCH Ass'y AWS-125
AUX
PHONO 1
PHONO 2
MIC
L
R
Lch
Rch
TAPE 1
TAPE 2
ADAPTOR
REC
PLAY
OUT
FLAT AMP Ass'y AWG-05
2SA798
2SC1315
2SA812
2SC1685
BALANCE CONTROL
VOLUME CONTROL
EQUALIZER Ass'y AWF-030
2SA872A
2SD325A
2SC1775A
2SB536
2SK131
40mA
CARTRIDGE LOAD Ass'y GWS-130
DIN CONNECTOR Ass'y AWX-062
330K
100K
DIN
METER AMP Ass

NOTE:

The indicated semiconductors are representative ones only. Other alternative semiconductors may be used and are listed in the parts lists.


4
5
6
A
B
C
D
RECTIFIER (L) Ass'y GWR-106
POWER SUPPLY Ass'y AWR-155
RECTIFIER (R) Ass'y GWR-107
FILTER Ass'y AWM-115 ⅓
FILTER Ass'y AWM-115 ⅔
TONE CONTROL Ass'y AWG-053
FILTER Ass'y AWM-115-3/3
POWER AMP (L) Ass'y GWH-109
POWER AMP (R) Ass'y GWH-110
METER AMP Ass'y AWM-126-½
Ass'y AWM-126-2/2
SPEAKER A
SPEAKER B
SPEAKER C
LEFT PEAK METER
RIGHT PEAK METER
AC 220V 240V 50/60Hz
PRE OUT
POWER IN

SWITCHES

S_1	FM	OFF — ON
S_2	AM	OFF — ON
S_3	AUX	OFF — ON
S_4	PHONO 2	OFF — ON
S_5	PHONO 1	OFF — ON
S_6	CARTRIDGE LOAD CAPACITOR (pF)	100 - 200 - 300 - 400
S_7	CARTRIDGE LOAD RESISTOR (Ω)	10K - 50K - 100K
S_8	FM MUTING	OFF — ON
S_9	MULTIPATH	OFF — ON
S_{10}	DE-EMPHASIS	NORMAL — 25μS
S_{11}	DUPLICATE	OFF — ON
S_{12}	TAPE PLAY 1	OFF — ON
S_{13}	TAPE PLAY 2	OFF — ON
S_{14}	ADAPTOR	OFF — ON
S_{15}	MODE	STEREO — MONO
S_{16}	ATT	OFF — 20dB
S_{17}	LOUDNESS	OFF — ON
S_{18}	TONE	OFF — ON
S_{19}	HIGH FILTER	OFF — ON
S_{20}	LOW FILTER	OFF — ON
S_{21}	RELAY	
S_{22}	SPEAKER A	OFF — ON
S_{23}	SPEAKER B	OFF — ON
S_{24}	SPEAKER C	OFF — ON
S_{25}	RELAY	
S_{26}	POWER	OFF — ON
S_{27}	PHONO INTERFERENCE FILTER	OFF — ON
S_{28}	LINE VOLTAGE SELECTOR	220V — 240V

RESISTORS:
IN OHM 1/4W ±5% TOLERANCE UNLESS OTHERWISE NOTED K: kΩ M: MΩ

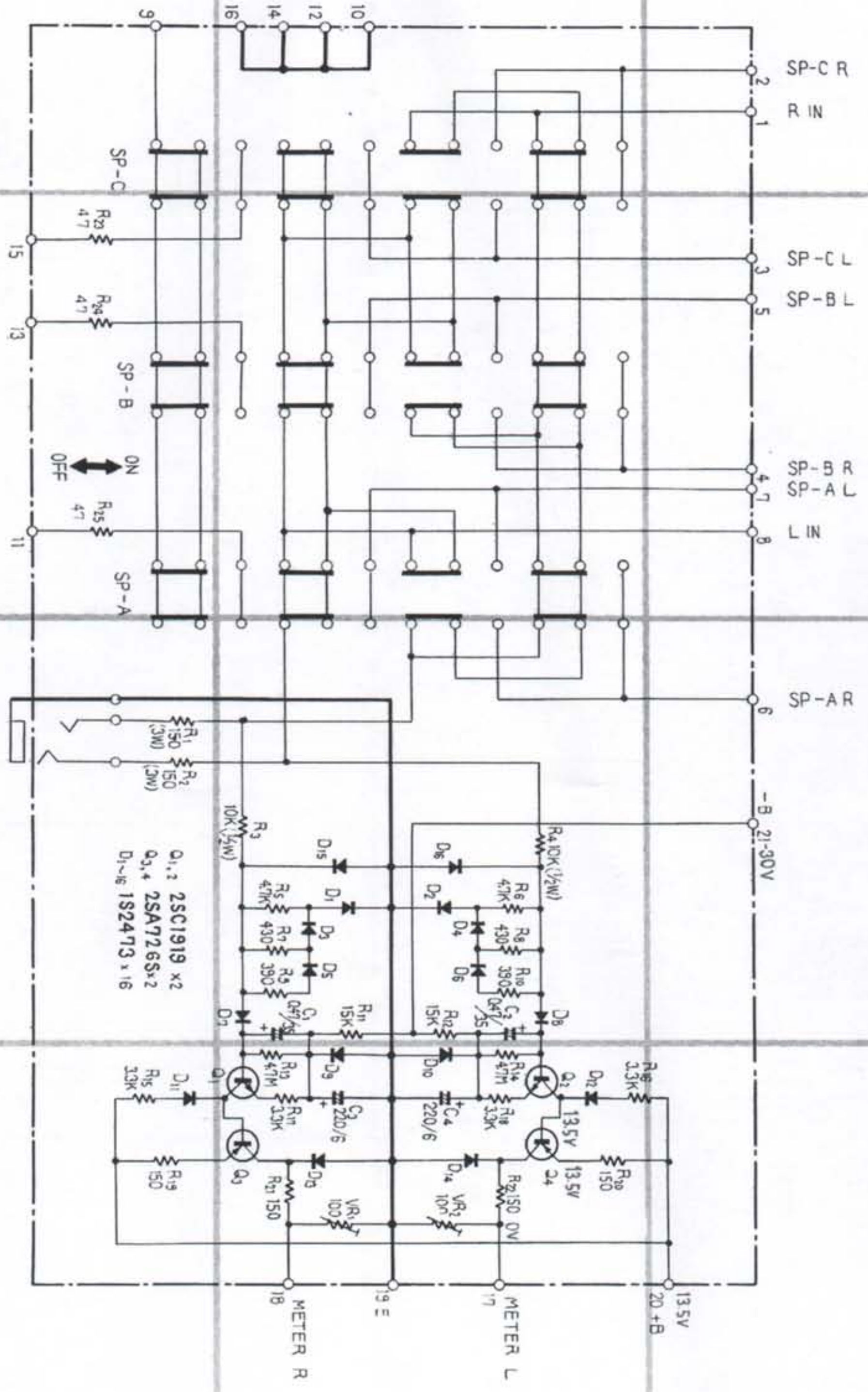
CAPACITORS:
IN μF UNLESS OTHERWISE NOTED P: pF

This is the basic schematic diagram, but the actual circuit may very due to improvement in design.

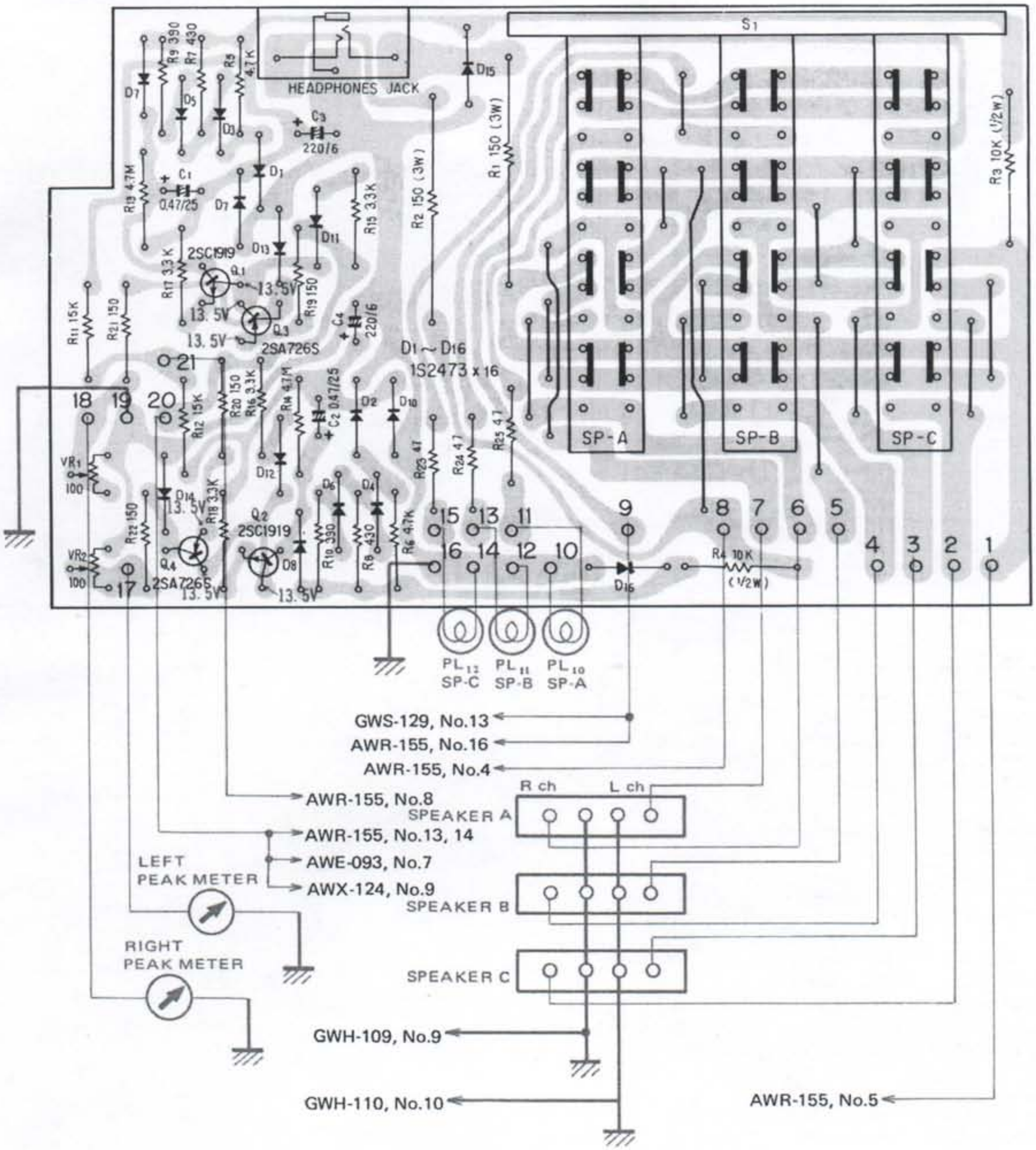
V (boxed)	SIGNAL VOLTAGE AT 270W×2 8Ω OUTPUT (1kHz)
V	DC VOLTAGE AT NO INPUT SIGNAL
mA	DC CURRENT AT NO INPUT SIGNAL
(V)	DC VOLTAGE AT 270W×2 OUTPUT

2.3 METER AMPLIFIER ASSEMBLY (AWM-126)

NOTE:
This assembly is applicable to the HG type.


9
16
14
12
10
SP-C R
2
R IN
1
SP-C
R23 47
15
SP-C L
3
SP-B L
5
R24 47
13
SP-B
ON
OFF
SP-B R
4
SP-A L
7
R25 47
11
L IN
8
SP-A
SP-A R
6
R1 150 (3W)
R2 150 (3W)
-B 21-30V
R3 10K (½W)
R4 10K (½W)
Q1, 2 2SC1919 x2
Q3, 4 2SA726S x2
D1~16 1S2473 x16
D15
D16
R5 4.7K
D1
D2
R6 4.7K
D3
R7 430
D4
R8 430
D5
R9 390
D6
R10 390
D7
C1 0.47/35
R11 15K
R12 15K
C2 0.47/35
D8
R13 4.7M
D9
D10
R14 4.7M
Q1
Q2
R15 3.3K
D11
R17 3.3K
C3 220/6
C4 220/6
R18 3.3K
D12
R16 3.3K
13.5V
Q3
Q4
R19 150
D13
R21 150
VR1 100
D14
VR2 100
R22 150
0V
R20 150
13.5V
18
METER R
19 E
17
METER L
20 +B
13.5V

Foil side



S1
HEADPHONES JACK
D15
R9 390
R7 430
R5 4.7K
D7
D5
D3
C3
220/6
R1 150 (3W)
R3 10K (1/2W)
R13 4.7M
C1
0.47/25
D1
D7
D11
R15 3.3K
R2 150 (3W)
2SC1919
Q1
D13
13.5V
R17 3.3K
Q3
R19 150
C4
220/6
2SA726S
R11 15K
R21 150
21
D1 ~ D16
1S2473 x 16
18
19
20
R12 15K
R20 150
R16 3.3K
R14 4.7M
C2 0.47/25
D2
D10
VR1
100
D12
R23 47
R24 47
R25 47
D14
R18 3.3K
D6
D4
Q2
2SC1919
Q4
2SA726S
D8
R10 390
R8 430
R6 4.7K
VR2
100
17
SP-A
SP-B
SP-C
15
13
11
9
8
7
6
5
16
14
12
10
4
3
2
1
D16
R4 10K
(1/2W)
PL12
SP-C
PL11
SP-B
PL10
SP-A
GWS-129, No.13
AWR-155, No.16
AWR-155, No.4
AWR-155, No.8
R ch
L ch
SPEAKER A
AWR-155, No.13, 14
AWE-093, No.7
AWX-124, No.9
LEFT
PEAK METER
SPEAKER B
RIGHT
PEAK METER
SPEAKER C
GWH-109, No.9
GWH-110, No.10
AWR-155, No.5

Parts List of Meter Amplifier Assembly (AWM-126)

SEMICONDUCTORS

Symbol	Part No.	Description
Q1	2SC1919-G or F (2SC1400-E or F)	Transistor
Q2	2SC1919-G or F (2SC1400-E or F)	Transistor
Q3	2SA726S-G or F (2SA750-E or F)	Transistor
Q4	2SA726S-G or F (2SA750-E or F)	Transistor
Q1	1S2473	Diode
Q2	1S2473	Diode
Q3	1S2473	Diode
Q4	1S2473	Diode
Q5	1S2473	Diode
Q6	1S2473	Diode
Q7	1S2473	Diode
Q8	1S2473	Diode
Q9	1S2473	Diode
Q10	1S2473	Diode
Q11	1S2473	Diode
Q12	1S2473	Diode
Q13	1S2473	Diode
Q14	1S2473	Diode
Q15	1S2473	Diode
Q16	1S2473	Diode

RESISTORS

Symbol	Part No.	Description		
R1	RS3P 151J	Metal oxide	150	3W
R2	RS3P 151J	Metal oxide	150	3W
R3	RD½PS 103J	Carbon film	10k	½W
R4	RD½PS 103J	Carbon film	10k	½W
R5	RD¼PS 472J	Carbon film	4.7k	
R6	RD¼PS 472J	Carbon film	4.7k	
R7	RD¼PS 431J	Carbon film	430	
R8	RD¼PS 431J	Carbon film	430	
R9	RD¼PS 391J	Carbon film	390	
R10	RD¼PS 391J	Carbon film	390	
R11	RD¼PS 153J	Carbon film	15k	
R12	RD¼PS 153J	Carbon film	15k	
R13	RD¼PS 475J	Carbon film	4.7M	
R14	RD¼PS 475J	Carbon film	4.7M	
R15	RD¼PS 332J	Carbon film	3.3k	
R16	RD¼PS 332J	Carbon film	3.3k	
R17	RD¼PS 332J	Carbon film	3.3k	
R18	RD¼PS 332J	Carbon film	3.3k	
R19	RD¼PSF 151J	Carbon film	150	
R20	RD¼PSF 151J	Carbon film	150	
R21	RD¼PSF 151J	Carbon film	150	
R22	RD¼PSF 151J	Carbon film	150	
R23	RD¼PS 470J	Carbon film	47	
R24	RD¼PS 470J	Carbon film	47	
R25	RD¼PS 470J	Carbon film	47	
VR1	ACP-019	Semi-fixed	(100-B)	
VR2	ACP-019	Semi-fixed	(100-B)	

CAPACITORS

Symbol	Part No.	Description		
C1	CSZA R47M 35	Electrolytic	0.47	35V
C2	CSZA R47M 35	Electrolytic	0.47	35V
C3	CEA 221P 6	Electrolytic	220	6V
C4	CEA 221P 6	Electrolytic	220	6V

SWITCH

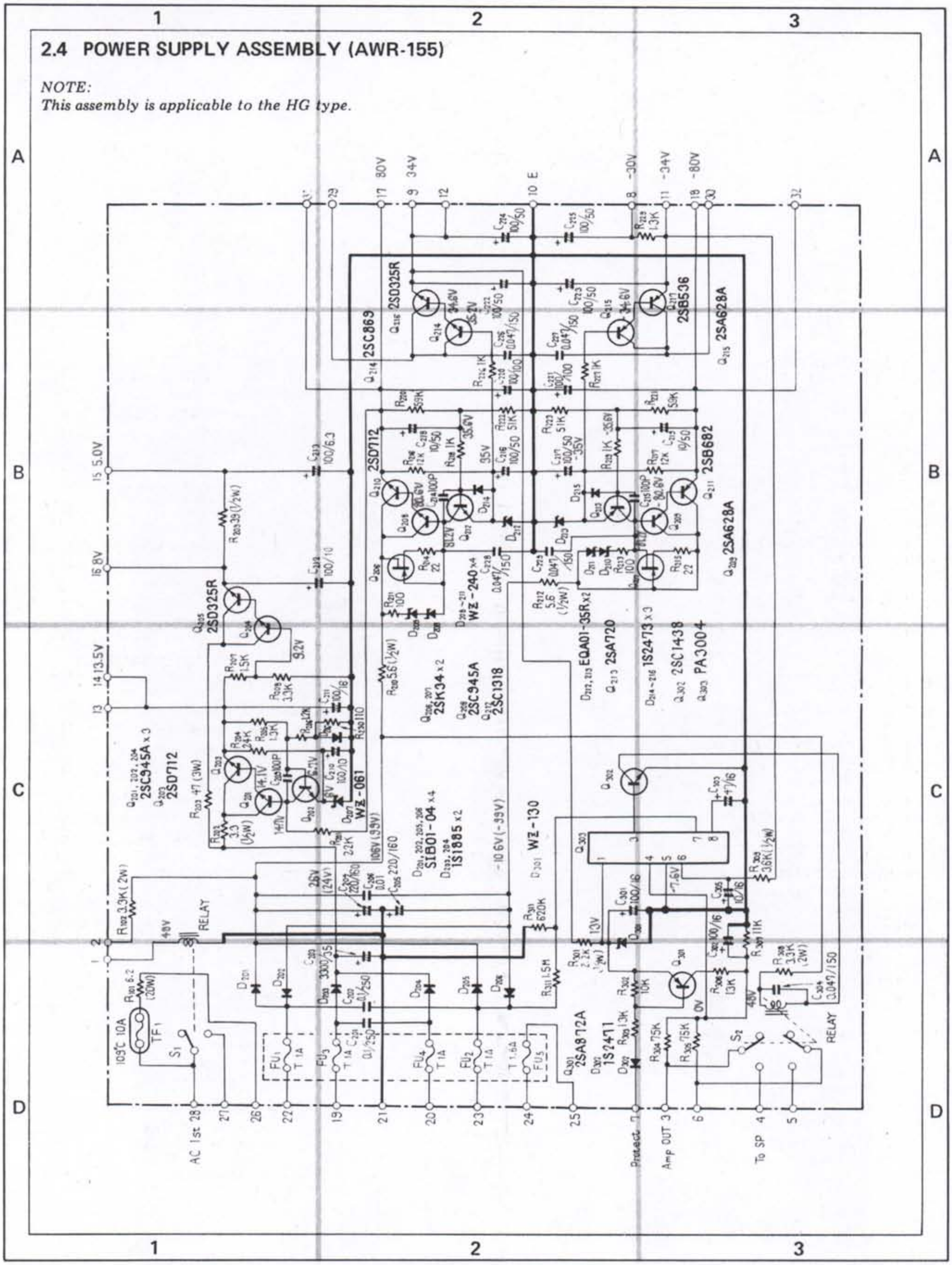
Symbol	Part No.	Description
S22-24	ASG-131	Push switch (SPEAKERS)

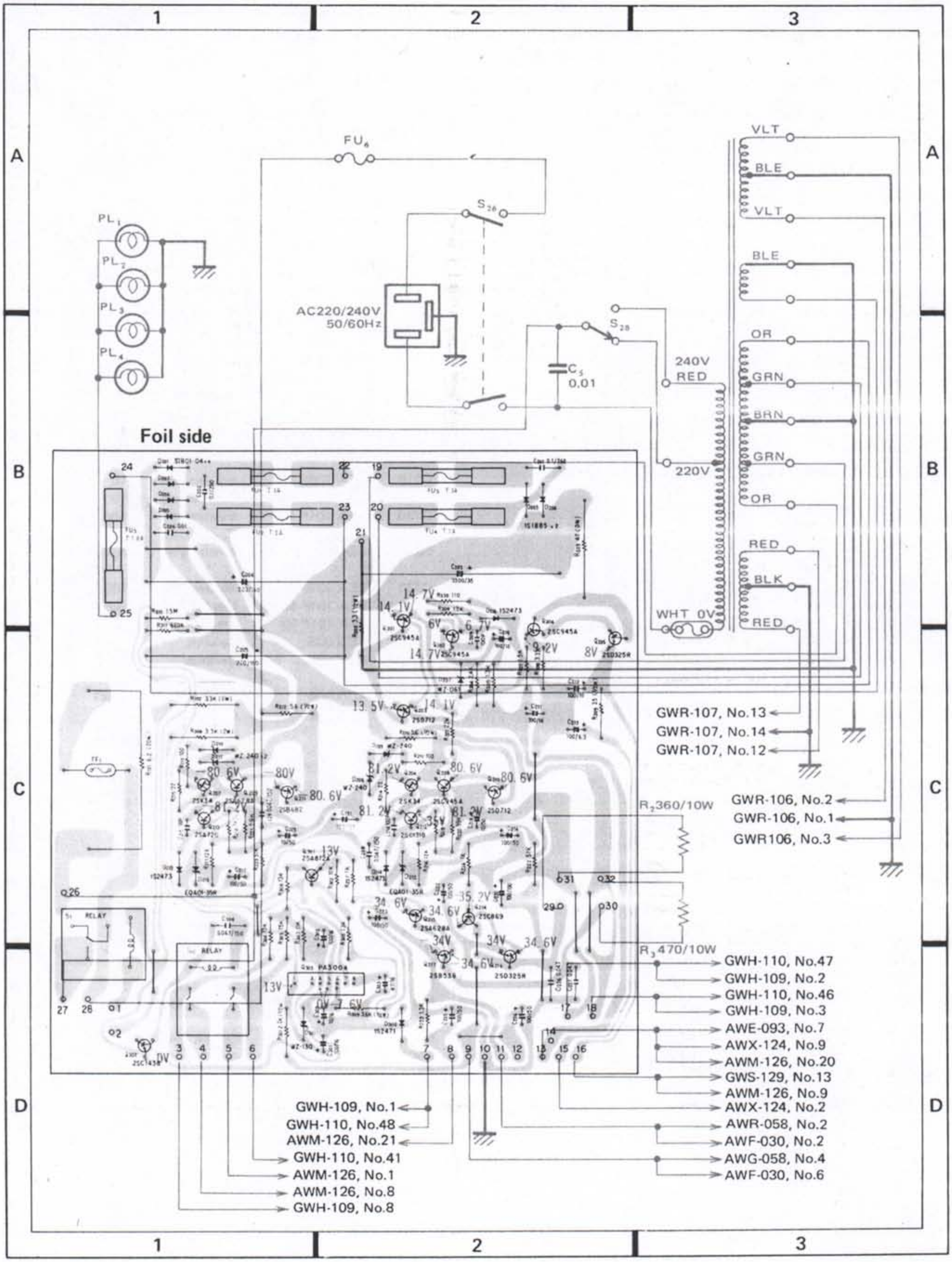
OTHER

Symbol	Part No.	Description
	AKN-010	Phone Jack (PHONES)

2.4 POWER SUPPLY ASSEMBLY (AWR-155)

NOTE:
This assembly is applicable to the HG type.


1
2
3
A
B
C
D
31
29
17 80V
9 34V
12
10 E
8 -30V
11 -34V
18 -80V
30
32
15 5.0V
16 8V
14 13.5V
13
2
1
AC 1st 28
27
26
22
19
21
20
23
24
25
Protect 7
Amp OUT 3
6
To SP 4
5
Q214 2SC869
Q216 2SD325R
Q215 2SA628A
Q217 2SB536
2SD712
2SB682
Q211 2SA628A
Q209 2SA628A
Q205 2SD325R
Q201, 202, 204 2SC945A x 3
Q203 2SD712
Q206, 207 2SK34 x 2
Q208 2SC945A
Q212 2SC1318
D208~211 WZ-240 x 4
D212, 213 EQA01-05R x 2
Q213 2SA720
D214~216 1S2473 x 3
Q302 2SC1438
Q303 PA3004
D201, 202, 205, 206 SIB01-04 x 4
D203, 204 1S1885 x 2
D207 WZ-061
D301 WZ-130
Q301 2SA872A
D302 1S2471
-10.6V (-99V)
106V (99V)
26V (24V)
48V
RELAY
TF1
109°C 10A
S1
S2
R101 6.2 (20W)
R102 3.3K (2W)
R203 39 (1/2W)
R207 1.5K
R208 3.3K
R202 47 (3W)
R203 3.3 (1/2W)
R201 22K
R220 5.6 (1/2W)
R212 5.6 (1/2W)
R301 620K
R311 1.5M
R302 10K
R303 13K
R304 75K
R305 75K
R306 13K
R307 2.2K (1/2W)
R308 3.3K (2W)
R309 11K
R310 36K (1/2W)
R213 1.3K
C201 0.1/250
C202 0.1/250
C203 3300/35
C204 220/160
C205 220/160
C206 0.01
C213 100/6.3
C212 100/10
C211 100/16
C210 100/10
C224 100/50
C225 100/50
C222 100/50
C223 100/50
C226 0.047/150
C227 0.047/150
C228 10/50
C215 10/50
C216 100/50
C217 100/50
C218 0.047/150
C219 0.047/150
C301 100/16
C302 100/16
C303 47/16
C304 0.047/150
C305 10/16
34.6V
35.2V
-34.6V
35.6V
-35.6V
35V
-35V
30.6V
-30.6V
31.2V
9.2V
14.1V
14.7V
-7.6V
13V
0V
FU1 T 1A
FU2 T 1A
FU3 T 1A
FU4 T 1A
FU5 T 1.6A


1
2
3
A
B
C
D
FU6
S26
PL1
PL2
PL3
PL4
AC220/240V
50/60Hz
C5
0.01
S28
240V
RED
220V
WHT 0V
VLT
BLE
VLT
BLE
OR
GRN
BRN
GRN
OR
RED
BLK
RED
Foil side
24
25
22
23
19
20
21
26
27
28
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
29
30
31
32
RELAY
14.7V
14.1V
6V
14.7V
9.2V
8V
2SC945A
2SD325R
13.5V
14.1V
2SD712
80.6V
81.2V
80.6V
80.6V
80.6V
81.2V
81.2V
81.2V
35V
13V
34.6V
34.6V
35.2V
34V
34V
34.6V
34.6V
2SK34
2SB682
2SA726
2SC1419
2SA872A
2SA628A
2SC869
2SB536
2SD325R
PA3004
13V
0V
7.6V
0V
2SC1436
1S2473
1S1885
R2 360/10W
R3 470/10W
GWR-107, No.13
GWR-107, No.14
GWR-107, No.12
GWR-106, No.2
GWR-106, No.1
GWR106, No.3
GWH-110, No.47
GWH-109, No.2
GWH-110, No.46
GWH-109, No.3
AWE-093, No.7
AWX-124, No.9
AWM-126, No.20
GWS-129, No.13
AWM-126, No.9
AWX-124, No.2
AWR-058, No.2
AWF-030, No.2
AWG-058, No.4
AWF-030, No.6
GWH-109, No.1
GWH-110, No.48
AWM-126, No.21
GWH-110, No.41
AWM-126, No.1
AWM-126, No.8
GWH-109, No.8
1
2
3

Parts List of Power Supply Assembly (AWR-155)

SEMICONDUCTORS

Symbol	Part No.	Description
Q201	2SC945A-Q,R or S	Transistor
Q202	2SC945A-Q,R or S	Transistor
Q203	2SD712-C or D	Transistor
Q204	2SC945A-Q,R or S	Transistor
Q205	2SD325R-E or D	Transistor
Q206	2SK34-C or D	FET
Q207	2SK34-C or D	FET
Q208	2SC945A-Q,R or S	Transistor
Q209	2SA628A-C or D	Transistor
Q210	2SD712-C or D	Transistor
Q211	2SB682-C or D	Transistor
Q212	2SC1318-Q or R	Transistor
Q213	2SA720-Q or R	Transistor
Q214	2SC869-C or D	Transistor
Q215	2SA628A-C or D	Transistor
Q216	2SD325R-E or D	Transistor
Q217	2SB536-L or M	Transistor
Q301	2SA872A-E or D (2SA904-F)	Transistor
Q302	2SC1438-V or B	Transistor
Q303	PA3004	IC
D201	SIB01-04	Diode
D202	SIB01-04	Diode
D203	1S1885 (SIB01-02)	Diode
D204	1S1885 (SIB01-02)	Diode
D205	SIB01-04	Diode
D206	SIB01-04	Diode
D207	WZ-061	Zener diode
D208	WZ-240 (MZ-240)	Zener diode
D209	WZ-240 (MZ-240)	Zener diode
D210	WZ-240 (MZ-240)	Zener diode
D211	WZ-240 (MZ-240)	Zener diode
D212	EQA01-35R	Zener diode
D213	EQA01-35R	Zener diode
D214	1S2473	Diode
D215	1S2473	Diode
D216	1S2473	Diode
D301	WZ-130 (MZ-130)	Zener diode
D302	1S2473	Diode

CAPACITORS

Symbol	Part No.	Description		
C201	CQMA 104K 250	Mylar	0.1	250V
C202	CQMA 104K 250	Mylar	0.1	250V
C203	ACH-332	Electrolytic	3300	35V
C204	ACH-331	Electrolytic	220	160V
C205	ACH-331	Electrolytic	220	160V
C206	ACG-001	Ceramic	0.01	250V
C209	CCDSL 101K 50	Ceramic	100p	50V
C210	CEA 101P 10	Electrolytic	100	10V
C211	CEA 101P 16	Electrolytic	100	16V
C212	CEA 101P 10	Electrolytic	100	10V
C213	CEA 101P 6	Electrolytic	100	6V
C214	CCDSL 101K 50	Ceramic	100p	50V
C215	CCDSL 101K 50	Ceramic	100p	50V
C216	CEA 101P 50	Electrolytic	100	50V
C217	CEA 101P 50	Electrolytic	100	50V
C218	CEA 100P 50	Electrolytic	10	50V
C219	CEA 100P 50	Electrolytic	10	50V
C220	CEA 101P 100	Electrolytic	100	100V
C221	CEA 101P 100	Electrolytic	100	100V
C222	CEA 101P 50	Electrolytic	100	50V
C223	CEA 101P 50	Electrolytic	100	50V
C224	CEA 101P 50	Electrolytic	100	50V
C225	CEA 101P 50	Electrolytic	100	50V
C226	ACG-009	Ceramic	0.047	150V
C227	ACG-009	Ceramic	0.047	150V
C228	ACG-009	Ceramic	0.047	150V
C229	ACG-009	Ceramic	0.047	150V
C301	CEA 101P 16	Electrolytic	100	16V
C302	CEA 101P 16	Electrolytic	100	16V
C303	CEA 470P 16	Electrolytic	47	16V
C304	ACG-009	Ceramic	0.047	150V
C305	CEA 100P 16	Electrolytic	10	16V

RESISTORS

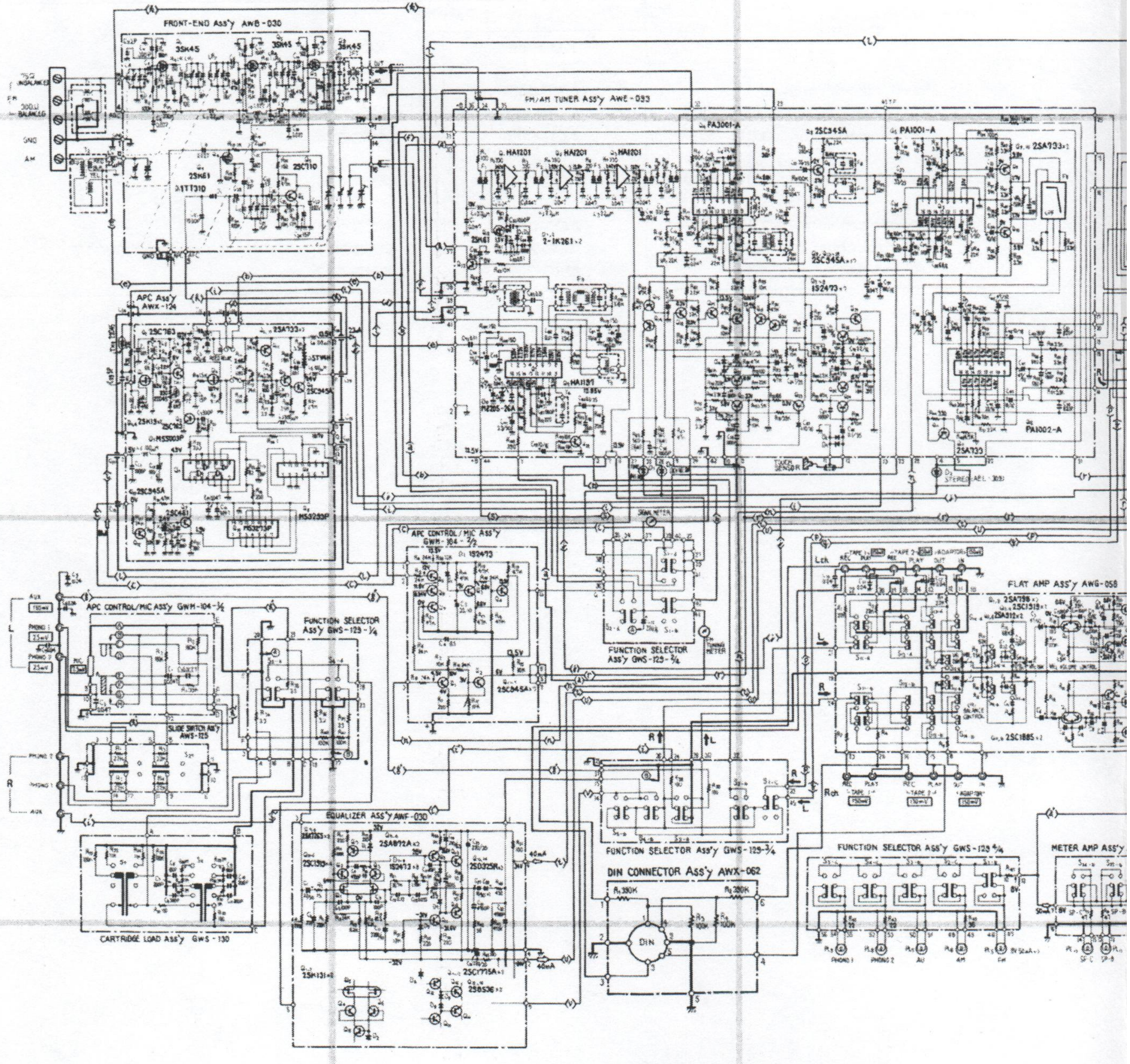
Symbol	Part No.	Description		
R101	ACN-021	Wire wound	6.2	20W
R102	RS2P 332J	Metal oxide	3.3k	2W
R201	RD¼PS 223J	Carbon film	22k	
R202	RD½PSF 3R3J	Carbon film	3.3	½W
R203	RS3P 470J	Metal oxide	47	3W
R204	RD¼PS 242J	Carbon film	2.4k	
R205	RD¼PS 132J	Carbon film	1.3k	
R206	RD¼PS 122J	Carbon film	1.2k	
R207	RD¼PS 152J	Carbon film	1.5k	
R208	RD¼PS 332J	Carbon film	3.3k	
R209	RD½PSF 390J	Carbon film	39	½W
R210	RD½PS 5R6J	Carbon film	5.6	½W

Symbol	Part No.	Description		
R211	RD¼PSF 101J	Carbon film	100	
R212	RD½PSF 5R6J	Carbon film	5.6	½W
R213	RD¼PSF 101J	Carbon film	100	
R214	RD¼PSF 220J	Carbon film	22	
R215	RD¼PSF 220J	Carbon film	22	
R216	RD¼PS 123J	Carbon film	12k	
R217	RD¼PS 123J	Carbon film	12k	
R218	RD¼PS 102J	Carbon film	1k	
R219	RD¼PS 102J	Carbon film	1k	
R220	RN½PT 5902F	Metal film	59k	½W
R221	RN½PT 5902F	Metal film	59k	½W
R222	RN½PT 5102F	Metal film	51k	½W
R223	RN½PT 5102F	Metal film	51k	½W
R226	RD¼PS 102J	Carbon film	1k	
R227	RD¼PS 102J	Carbon film	1k	
R228				
R229	RD¼PS 132J	Carbon film	1.3k	
R230	RD¼PS 111J	Carbon film	110	
R301	RD½PSF 222J	Carbon film	2.2k	½W
R302	RD¼PS 103J	Carbon film	10k	
R303	RD¼PS 133J	Carbon film	13k	
R304	RD¼PS 753J	Carbon film	75k	
R305	RD¼PS 753J	Carbon film	75k	
R306	RD¼PS 132J	Carbon film	1.3k	
R307	RD¼PS 113J	Carbon film	11k	
R308	RS2P 332J	Metal oxide	3.3k	2W
R309	RD½PSF 362J	Carbon film	3.6k	½W
R310	RD¼PS 155J	Carbon film	1.5M	
R311	RD¼PS 624J	Carbon film	620k	

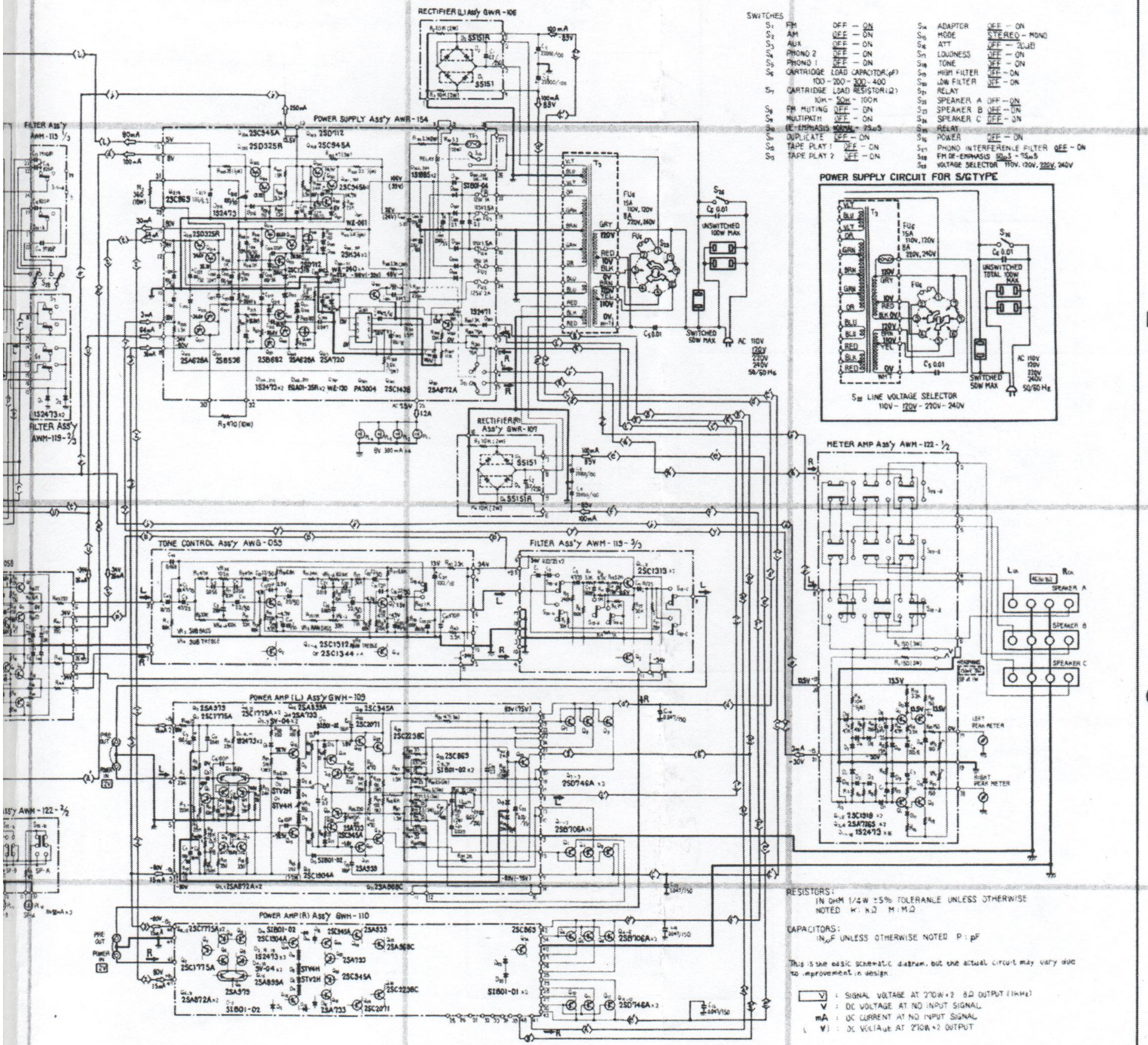
OTHERS

Symbol	Part No.	Description
S1	ASR-046	Relay (primary)
S2	ASR-048	Relay (protection)
TF	AEX-001	Microtemp
	AKR-010	Fuse clip
	ANH-340	Heat sink
	ANH-203	Heat sink
	ANH-425	Heat sink
	AKH-002	Transistor socket
	AEC-088	Insulator spacer

3.2 SCHEMATIC DIAGRAM (for S and S/G)


1
2
3
A
B
C
D
FRONT-END Ass'y AWB-030
FM/AM TUNER Ass'y AWE-033
APC Ass'y AWX-124
APC CONTROL/MIC Ass'y GWM-104-1/2
APC CONTROL/MIC Ass'y GWM-104-2/2
FUNCTION SELECTOR Ass'y GWS-125-1/4
FUNCTION SELECTOR Ass'y GWS-125-2/4
FUNCTION SELECTOR Ass'y GWS-125-3/4
FUNCTION SELECTOR Ass'y GWS-125-4/4
SLIDE SWITCH Ass'y AWS-125
CARTRIDGE LOAD Ass'y GWS-130
EQUALIZER Ass'y AWF-030
DIN CONNECTOR Ass'y AWX-062
FLAT AMP Ass'y AWG-058
METER AMP Ass'y
SIGNAL METER
TUNING METER
TOUCH SENSOR
STEREO
PA3001-A
PA1001-A
PA1002-A
HA1201
HA1137
2SC945A
2SA733
2SK61
3SK45
2SC1815
2SD325
2SC1775A
2SA798
2SC1885
DIN
AUX
PHONO 1
PHONO 2
MIC
L
R
Lch
Rch
TAPE 1
TAPE 2
ADAPTOR
REC
PLAY
IN
OUT
AM
FM
GND
75Ω UNBALANCED
300Ω BALANCED
VOLUME CONTROL
BALANCE CONTROL
40mA

NOTE:
The indicated semiconductors are representative ones only. Other alternative semiconductors may be used and are listed in the parts lists.



4
5
6
A
B
C
D
RECTIFIER (L) Ass'y GWR-106
POWER SUPPLY Ass'y AWR-154
FILTER Ass'y AWH-119-1/3
FILTER Ass'y AWH-119-2/3
RECTIFIER (R) Ass'y GWR-107
POWER SUPPLY CIRCUIT FOR S/G TYPE
S29 LINE VOLTAGE SELECTOR 110V - 120V - 220V - 240V
METER AMP Ass'y AWM-122-1/2
TONE CONTROL Ass'y AWG-055
FILTER Ass'y AWH-119-3/3
POWER AMP (L) Ass'y GWH-109
POWER AMP (R) Ass'y GWH-110
Ass'y AWM-122-2/2
SPEAKER A
SPEAKER B
SPEAKER C
LEFT PEAK METER
RIGHT PEAK METER
UNSWITCHED 100W MAX
SWITCHED 50W MAX
AC 110V 120V 220V 240V 50/60Hz

SWITCHES

S_1	FM	OFF – ON	S_{14}	ADAPTOR	OFF – ON
S_2	AM	OFF – ON	S_{15}	MODE	STEREO – MONO
S_3	AUX	OFF – ON	S_{16}	ATT	OFF – 20dB
S_4	PHONO 2	OFF – ON	S_{17}	LOUDNESS	OFF – ON
S_5	PHONO 1	OFF – ON	S_{18}	TONE	OFF – ON
S_6	CARTRIDGE LOAD CAPACITOR(pF) 100 – 200 – 300 – 400		S_{19}	HIGH FILTER	OFF – ON
S_7	CARTRIDGE LOAD RESISTOR(Ω) 10K – 50K – 100K		S_{20}	LOW FILTER	OFF – ON
			S_{21}	RELAY	
			S_{22}	SPEAKER A	OFF – ON
S_8	FM MUTING	OFF – ON	S_{23}	SPEAKER B	OFF – ON
S_9	MULTIPATH	OFF – ON	S_{24}	SPEAKER C	OFF – ON
S_{10}	DE-EMPHASIS	NORMAL – 25μS	S_{25}	RELAY	
S_{11}	DUPLICATE	OFF – ON	S_{26}	POWER	OFF – ON
S_{12}	TAPE PLAY 1	OFF – ON	S_{27}	PHONO INTERFERENCE FILTER	OFF – ON
S_{13}	TAPE PLAY 2	OFF – ON	S_{28}	FM DE-EMPHASIS	50μS – 75μS
			S_{29}	VOLTAGE SELECTOR	110V, 120V, 220V, 240V

RESISTORS:
IN OHM 1/4W ±5% TOLERANCE UNLESS OTHERWISE NOTED K: kΩ M: MΩ

CAPACITORS:
IN μF UNLESS OTHERWISE NOTED P: pF

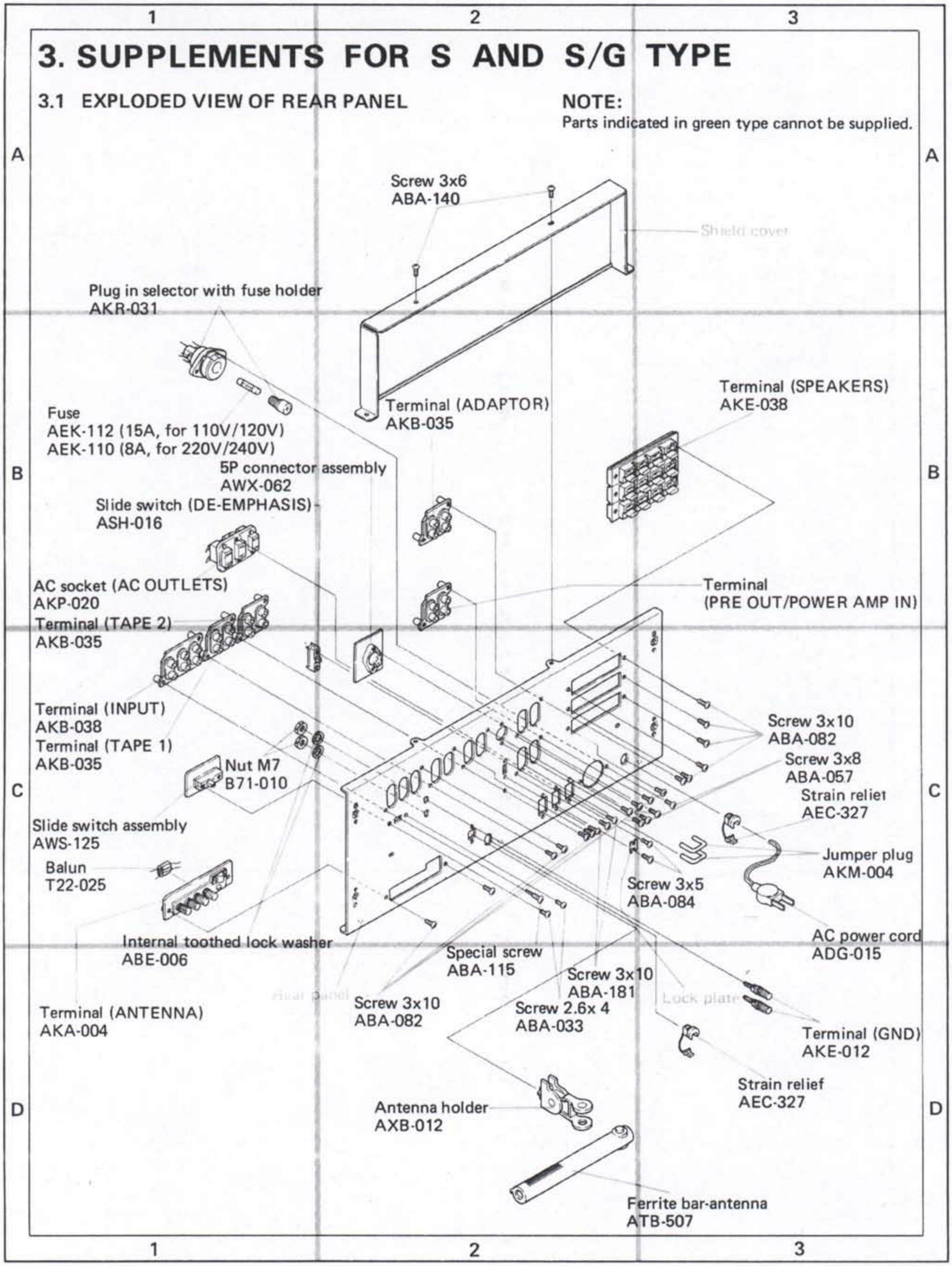
This is the basic schematic diagram, but the actual circuit may vary due to improvement in design.

- $\boxed{\text{V}}$: SIGNAL VOLTAGE AT 270W×2 8Ω OUTPUT (1kHz)
- V : DC VOLTAGE AT NO INPUT SIGNAL
- mA : DC CURRENT AT NO INPUT SIGNAL
- (V) : DC VOLTAGE AT 270W×2 OUTPUT

3. SUPPLEMENTS FOR S AND S/G TYPE

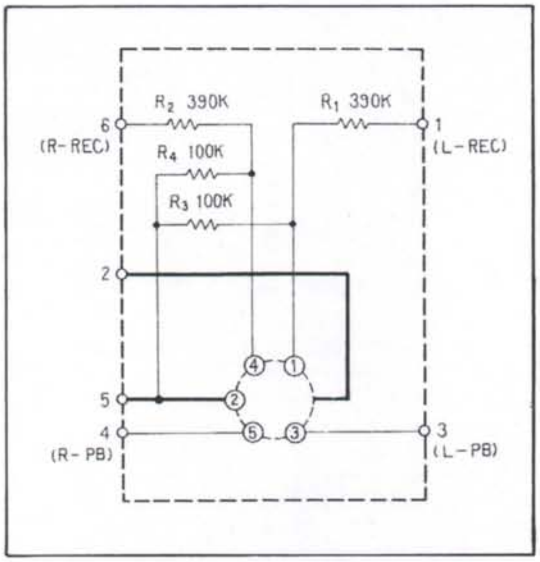
3.1 EXPLODED VIEW OF REAR PANEL

NOTE:
Parts indicated in green type cannot be supplied.



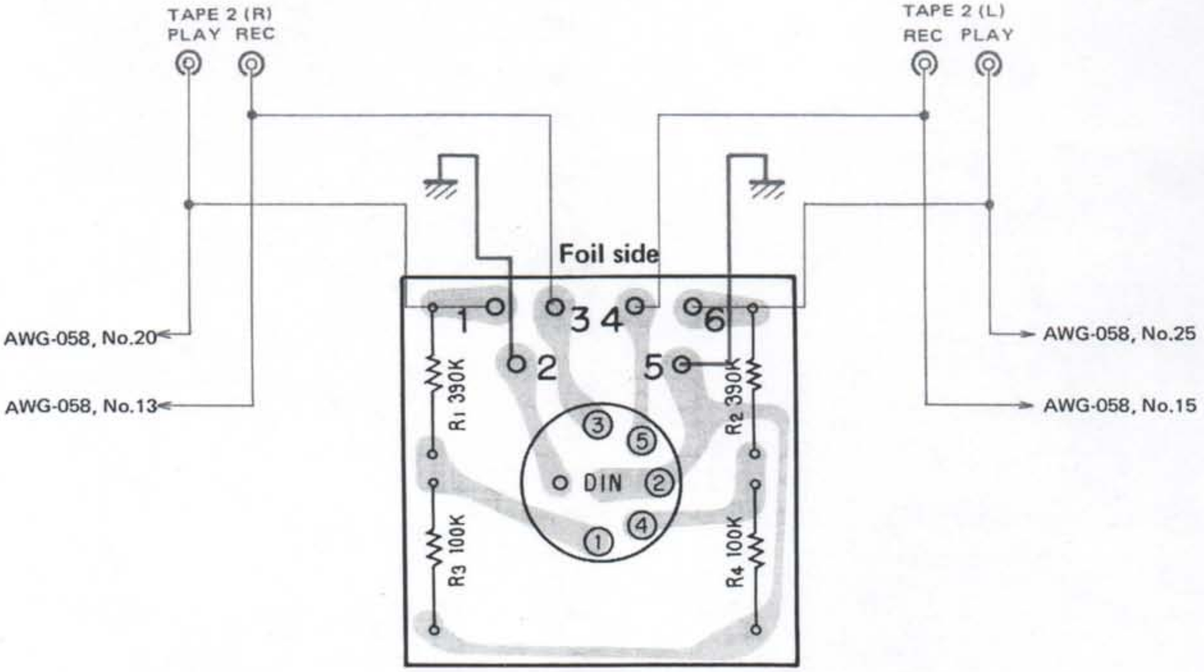
1
2
3
A
B
C
D
Screw 3x6
ABA-140
Shield cover
Plug in selector with fuse holder
AKR-031
Terminal (SPEAKERS)
AKE-038
Fuse
AEK-112 (15A, for 110V/120V)
AEK-110 (8A, for 220V/240V)
Terminal (ADAPTOR)
AKB-035
5P connector assembly
AWX-062
Slide switch (DE-EMPHASIS)
ASH-016
AC socket (AC OUTLETS)
AKP-020
Terminal (TAPE 2)
AKB-035
Terminal
(PRE OUT/POWER AMP IN)
Terminal (INPUT)
AKB-038
Terminal (TAPE 1)
AKB-035
Nut M7
B71-010
Screw 3x10
ABA-082
Screw 3x8
ABA-057
Strain relief
AEC-327
Slide switch assembly
AWS-125
Jumper plug
AKM-004
Balun
T22-025
Screw 3x5
ABA-084
Internal toothed lock washer
ABE-006
Special screw
ABA-115
AC power cord
ADG-015
Screw 3x10
ABA-181
Rear panel
Screw 3x10
ABA-082
Screw 2.6x 4
ABA-033
Lock plate
Terminal (ANTENNA)
AKA-004
Terminal (GND)
AKE-012
Strain relief
AEC-327
Antenna holder
AXB-012
Ferrite bar-antenna
ATB-507

4. 5P CONNECTOR ASSEMBLY(AWX-062)


R₂ 390K
R₁ 390K
6
(R-REC)
1
(L-REC)
R₄ 100K
R₃ 100K
2
④
①
5
②
4
(R-PB)
⑤
③
3
(L-PB)

Parts List

Symbol	Part No.	Description
R1	RD¼PS 394J	Carbon film resistor 390k
R2	RD¼PS 394J	Carbon film resistor 390k
R3	RD¼PS 104J	Carbon film resistor 100k
R4	RD¼PS 104J	Carbon film resistor 100k
	AKP-011	Connector socket (REC/PLAY)


TAPE 2 (R)
PLAY REC
TAPE 2 (L)
REC PLAY
Foil side
AWG-058, No.20
AWG-058, No.13
AWG-058, No.25
AWG-058, No.15
1
2
3
4
5
6
R1 390K
R2 390K
R3 100K
R4 100K
③
⑤
DIN
②
④
①

SUPPLEMENTS FOR MODEL SX-1980/KC

Model SX-1980/KC is the same as SX-1980/KU with exception of descriptions in this supplements.

Contrast of Miscellaneous Parts

Symbol	Description	Part No.		Remarks
		KU type	KC type	
T3	Power transformer	ATT-446	ATT-459	
C5	Ceramic capacitor 0.01 125V	ACG-003	ACG-014	
C6	Ceramic capacitor 0.01 125V	ACG-003	ACG-014	
C17	Ceramic capacitor 0.01 125V	ACG-003	ACG-014	
	Capacitor cover	AEC-279	AEC-365	for C5, C6, C17
	Packing case	AHD-506	AHD-527	

PIONEER®

U.S. PIONEER ELECTRONICS CORP.
85 OXFORD DRIVE, MOONACHIE, NEW JERSEY 07074 (201) 440-8100

NO.: SB-A1B-01
DATE: Feb. 17, 1981

SERVICE BULLETIN

MODEL: SX-1980

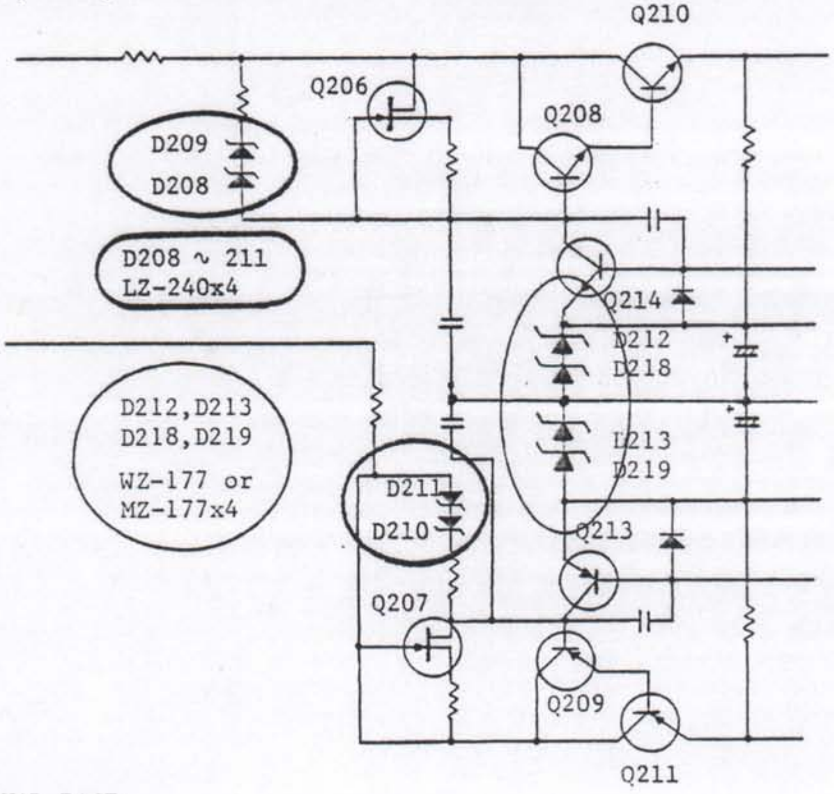
1) SUBJECT: Change of zener diodes in the power supply assembly.

SX-1980/KU, KC, S, S/G: AWR-154
" HG : AWR-155

REASON: To prevent zener diode damage during power switch activation.

D212, D213 : EQA01-35R ⟶ WZ-177 or MZ-177
D218, D219 : ADDED ⟶ WZ-177 or MZ-177

D208, D209, D210, D211 : WZ-240 ⟶ LZ-240


Q210
Q206
Q208
D209
D208
D208 ~ 211
LZ-240x4
Q214
D212
D218
D212,D213
D218,D219
WZ-177 or
MZ-177x4
D213
D219
D211
D210
Q213
Q207
Q209
Q211

SERVICE MANUAL PAGE:
(ART-263) ------------------------ 100,114
APPLICABLE MONTH: September 1978

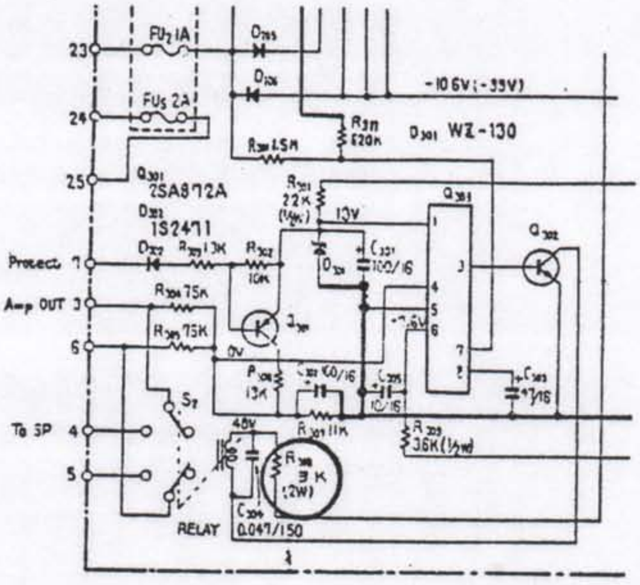
Please turn over

SUBJECT: Circuit modification of power supply assembly (AWR-154, 155)

REASON: Prevention of improper protection circuit operation when the AC input is low.

R308: 3.3 K ⟶ 3 K

RS2P332J RS2P302J


23
24
25
FU₇ 1A
FU₅ 2A
D₃₀₅
D₃₀₆
-10.6V (-35V)
R₃₁₁ 820K
R₃₁₀ 4.5M
D₃₀₁ WZ-130
Q₃₀₁
2SA872A
D₃₀₂
1S2471
R₃₀₁
22K
(1/4W)
13V
Q₃₀₃
Q₃₀₂
Protect 7
D₃₀₂
R₃₀₃ 13K
R₃₀₂
10K
D₃₀₄
C₃₀₁
100/16
Amp OUT 3
R₃₀₄ 75K
R₃₀₅ 75K
6
0V
Q₃₀₁
-7.6V
1
3
4
5
6
7
8
R₃₀₆
13K
C₃₀₂ 60/16
C₃₀₅
10/16
C₃₀₃
47/16
R₃₀₇ 11K
R₃₀₉
36K (1/2W)
S₁
To SP 4
5
48V
R₃₀₈
3 K
(2W)
C₃₀₄
0.047/150
RELAY

APPLICABLE SERIAL NO. AND MONTH:

SX-1980/KU	3606601
/S/G	2901051
/S	2600551
/KC	3400401
/HG	8400451

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